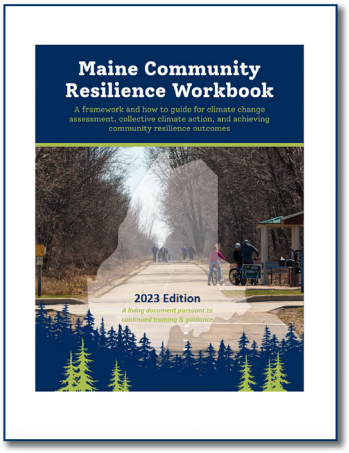
Maine Community Resilience Workbook

A framework and how-to guide for climate change assessment, collective climate action, and achieving community resilience outcomes

2023 Edition: A living document pursuant to continued training and guidance



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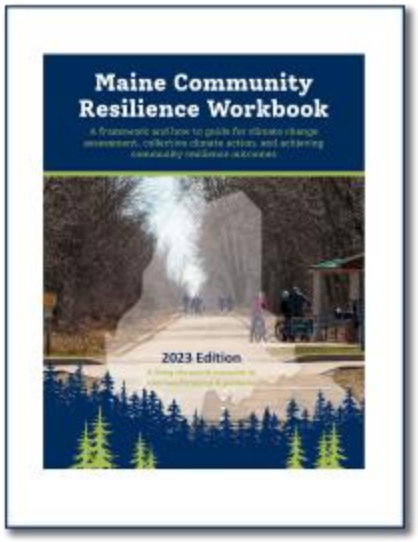

Foreword and Acknowledgment

Communities across Maine are already adapting to climate change. Collectively we are learning how to respond to these changes – intensifying storm patterns, warmer weather and waters, species shifts, ticks, pollen, and summer droughts. Municipalities, Wabanaki Tribal Nations, businesses, and homeowners are making plans, investing in infrastructure, and making operational changes to keep people safe, keep communities vibrant, and build their resilience.

The workbook is intended for municipalities and service providers working with communities for climate change and climate change-related projects.[1] However, whole community climate action has always been driven by a variety of different community members and active stakeholders and businesses, so the concepts and resources in the workbook may be of equal use for others to draw on.

There is no need to reinvent the wheel. We can expedite climate solutions in Maine by communicating what we already know is working and by learning together. This workbook assists in the efficacy of people, communities, and networks in Maine that are taking climate actions and supports timely information sharing across those actors.

The 2023 Edition of the Community Resilience Workbook was compiled during a transformative time for climate action in Maine. Best practices for climate resilience and Maine's specific landscape of climate preparedness activities are inherently evolving. So too will future versions of this resource expand and refine guidance for climate action. Sustained commitment and innovation are thus needed to ensure that this resource

continues to foster meaningful outcomes for communities across Maine. We thank, in advance, the future contributors and participants who will steward the journey.

Acknowledgment

The 2023 edition would not be possible without many authors and advisory contributors who provided topical expertise and galvanized the energy for this important milestone of publication.

A special acknowledgment is included for the funders and drivers behind this project, the Governor's Office of Policy Innovation and the Future, The Nature Conservancy in Maine, the Senator George J. Mitchell Center for Sustainability Solutions at the University of Maine, the Maine Department of Environmental Protection, the Maine Department of Agriculture, Conservation and Forestry, Maine Sea Grant, and the Maine Climate Science Information Exchange. This resource connects with the ongoing efforts of the Maine Climate Council (MCC) to understand and support resilience-related needs within Maine's communities. The Mitchell Center has been working with MCC representatives to provide recommendations to strengthen the MCC's equity commitments and collaborative approaches to build capacities for climate adaptation, especially for diverse and underserved communities. The Mitchell Center's first report, *Assessing the Potential Equity Outcomes of Maine's Climate Action Plan: Framework, Analysis, and Recommendations*, served as a foundation for sections of the Community Resilience Workbook.

Dr. Bridie McGreavy, Dr. Adam Daigneault, and Joey Reed at the University of Maine were integral in developing climate adaptation metrics and outcomes and a resilience assessment framework. These initial steps evolved into a broader and more collaborative project following extensive stakeholder outreach and review in the summer of 2021. In September of 2021, this core team expanded to include Jessica Gribbon Joyce of Tidal Bay Consulting, to adapt the deliverables to integrate the stakeholder feedback and coordinate early drafts of the workbook. Nathan Robbins from the Maine Department of Environmental Protection, Dr. Parker Gassett from the Maine Climate Science Information Exchange and Maine Sea Grant, and Esperanza Stancioff from Maine Sea Grant and UMaine Cooperative Extension Office joined the core team to connect this work with Maine's broader community of practice for climate change preparedness and the Climate Change Adaptation Providers Network. Samantha Horn, Jeremy Bell, Judy East, and Brian Ambrette provided valuable leadership in situating this work to align with broader resilience initiatives. Nathan Robbins and Parker Gassett served as principal coordinators

throughout 2022 leading to the 2023 edition of the Maine Community Resilience Workbook.

Many individuals generously provided input as reviewers, authors or advisory contributors to outline development, specific content revisions, outreach and testing, some of whom are recognized below:

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[1] We intend to connect this workbook with Wabanaki Tribal Nations, including the Penobscot Nation, the Passamaquoddy Tribes, the Houlton Band of Maliseet Indians, and the Mi'kmaq Nation, and related efforts through the Maine Climate Council to better understand how this resource or a related effort could support Wabanaki climate justice, climate adaptation, and Tribal sovereignty. While we hope that the content in this workbook will be relevant to Tribal audiences, we do not assume that it will be and recognize there is more work to be done to center Wabanaki perspectives and connect across Maine and Wabanaki climate adaptation efforts.

1: How to Use the Community Resilience Workbook

Starting a process of planning for climate change can be a daunting task. With many resources at the local, state, and national levels around climate adaptation, including decision support and analysis tools, guidance documents, and map viewers it's difficult to know which ones are most helpful. **The Community Resilience Workbook (CRW) synthesizes available guidance and resources to date into one document and provides a framework and stepwise process for including climate change in community-wide planning, municipal operations, or in homes and businesses for multiple users.**[2] The CRW organizes steps in building resilience to guide a sustainable, long-term approach for communities and local governments. Additionally outlined are pathways to collaborate within your community and with other experts in the region. Each section of the report is supported by case studies for users to access tangible examples and to promote connection with peers.

The Community Resilience Workbook aims to:

- Strengthen community resilience processes and outcomes by providing a comprehensive framework for building resilience
- Ensure communities receive appropriate levels of guidance to incorporate climate resilience into day-to-day decision-making, including questions to ask when developing policy, plans, programs, and projects.
- Provide communities a resource to point to that gives initiative to climate action
- Provide clear decision support tools and information for those working on community resilience initiatives
- Ensure resources are allocated equitably
- Ensure resources allocated are used effectively
- Ensure local efforts are defensible and replicable
- Create a community of practice for transferable lessons
- Offer metrics to evaluate projects that can be consistently applied across the region

The guidance of the Community Resilience Workbook builds on many years of practice, trial and error, learning, and success by municipalities and their partners to build community resilience to climate change impacts in Maine and to reduce their greenhouse gas emissions. Previous efforts and new initiatives continue to inform statewide responses and policies to meet community resilience needs. [3]

[2] As part of tailoring this workbook to Maine's unique needs, authors examined and synthesized the best available community resilience guidance already in use in Maine as well as existing resources from other states, federal agencies, and climate change adaptation networks.

[3] Community resilience efforts at the state level in Maine have been advanced through various initiatives that have been informed by community-level actions since at least the early 2000s with enacted legislation for initial State Climate Action and Adaptation Plans and coalition building.

2: Starting a New Municipal or Regional Climate Adaptation Initiative

Alignment with State and Maine Climate Council Strategies

- Strategy F: Build Healthy and Resilient Communities
- Strategy H: Engage with Maine People and Communities about Climate Impacts and Program Opportunities

Why adapt to a changing climate in this region?

- Prepare the people, places, and environments that we care for
- Save money for communities and individuals by avoiding chronic repairs and damage
- Preserve each community's ways of life

Maine State Climate Plans recommend establishing a center of gravity for municipal climate initiatives, identifying lead points of contact, and empowering those individuals and teams by creating underlying, common objectives, goals, and 'frameworks' to ensure communities adopt consistent, effective, and measurable strategies. Informative decision-making questions and criteria can be tailored for each community's needs and help to design projects and evaluate the effectiveness and broader impacts of adaptation responses and measures.

2.1 Creating a Team

Successful development and implementation of adaptation and resilience projects hinge on establishing points of contact within municipal and Tribal government. Progress on climate action is often carried out through the dedicated work of small teams, often with supporting partners. This could include establishing a new committee, tasking an existing committee with new climate change-related initiatives, or designating staff or volunteers to coordinate activities.

Coordination across government, with multiple points of input, can align and reinforce priorities for proactive and preventative responses. In the spirit of working together for

long-term success, groups can share lessons and identify and agree on solutions. As described more fully below, equity should be a priority, with a commitment to high standards for participation and inclusion and a focus on vulnerable groups, including the risks they face and social impacts across the community.

Working in teams builds a sustainable foundation for continuity of work over time as multiple people participate with different roles and fluctuating levels of engagement. This approach creates information flow across coordinators to other team members and partners and reinforces the principle that each project presents an opportunity while increasing the likelihood of including climate change solutions across all projects.

2.2 Celebrate Your Current Successes

When climate change service providers begin working with communities, it is not uncommon for municipal officials to articulate that their town has taken few or no steps for climate change preparedness. Quotes from town officials like, "keeping up with day-to-day needs often takes priority [over work on climate change]," illustrate that climate resilience may be viewed as a discreet series of actions rather than an overarching factor in municipal activities.

However, the scope of municipal and Tribal governance responsibilities and the often-bustling pace of decision-making and project implementation regularly show a portfolio of efforts focused on the same issues which are most important to climate change experts. The priorities of public works departments, the ongoing activities of emergency management agencies, and current town planning efforts across municipalities in Maine consistently relate to the environmental and societal challenges which are exacerbated by climate change. Remember to take stock of what has already been done, use that information to inform planning and future projects, and most importantly take a moment to celebrate your current successes.

Much can be accomplished, and often already is in small or larger ways, by incorporating best practices for climate change into ongoing municipal activities. Interest in thinking long-term about climate change risks and developing community resilience to coastal hazards is common among government officials. Sea level rise, storm surge, and flooding (coastal and inland) are often vocalized concerns among public officials in Maine. Additionally, common concerns include erosion, saltwater intrusion, wind damage, drought, heat waves, and the impacts of ocean climate change on fisheries, or agriculture, and natural resource industries. As a result,

communities are simultaneously interested in strategically incorporating climate change into near-term identified projects, and in taking a broader whole-community approach to assessing risk for holistic climate change planning, prioritization, or reprioritization. For example, efforts to replace or enlarge stormwater conduits, tackle place-based coastal erosion, or augment emergency management, resource management, or town zoning in response to changing flood occurrences, are all practical opportunities to incorporate climate science.

2.3 Defining Resilience

Resilience refers to the ability of any individual, community, or system to prepare for and respond to social and environmental challenges in ways that allow it to bounce back or bounce forward. Using an example of inland flooding along the Kennebec River, community resilience would be demonstrated when the people who live nearby understand their vulnerabilities (i.e., risk or exposure to harm), can organize opportunities for informed deliberation about responding as homeowners and as a community, and can acquire the needed resources to carry out informed decisions. **Adaptation** is the suite of actual responses to climate change, in this case, what is done by homeowners and the community about the increased risks associated with flooding. **Adaptive capacity** refers to the social and technical skills and strategies that are collectively available for individuals and communities to build resilience to climate change hazards. Examples include the ways in which people in a community connect with each other, learn, generate ideas, tap into diverse forms of leadership, and respond to all kinds of transitions or challenges. Finally, **hazard mitigation** is any sustained action taken to reduce or eliminate the long-term risk to human life and property from natural hazards.

Returning to the Kennebec River example, an important aspect of adaptive capacity includes how information about flood risk to riverside infrastructure is communicated and understood by stakeholders and decision-makers, as well as the formal and informal relationships between stakeholders and decision-makers that enable consensus, problem-solving, and adaptive action. The community may decide to have the town purchase homes with the most chronic risks and repurpose the land while other homeowners may opt to fortify structures to safely handle occasional flooding. With better and broader adaptive capacity, specific climate adaptations and outcomes for communities are improved and diversified.

Another concept included throughout the Workbook is **climate mitigation**, human intervention to reduce the rate of climate change by limiting greenhouse gas emissions in

the atmosphere through natural processes, technological processes, or behavior change. Putting this all together, climate mitigation reduces the rate of climate change and the amount of climate change in the future. Because of the lag time in the climate system due to reductions of greenhouse gas emissions, the dividends of climate mitigation actions taken now won't be seen in the atmosphere for several decades (by the mid-21st century). Climate change impacts projected now for the next thirty years are therefore highly likely. Adaptation and hazard mitigation are the actions taken to reduce vulnerability to the impact of climate change presently and in the future. Resilience can be an outcome or ability achieved through the cumulative effect of adaptation and hazard mitigation actions.[4]

2.4 Generating Resilience Goals

It is important to generate goals to help guide workflow. The Maine Climate Council made use of four overarching goals to develop the 2020 Maine Climate Action Plan. They are provided here as examples as they encompass a few of the major areas where climate change actions are taken. These may also be helpful as a starting point for municipal discussions that can be used or adapted for a town's use.

- Reduce Greenhouse Gas Emissions
- Avoid the Impacts and Costs of Inaction
- Foster Economic Opportunity and Prosperity Today
- Advance Equity through Climate Response

When developing climate action goals, it is important to remember that climate change mitigation actions, hazard mitigation, and adaptation actions are a part of everyday work and can lay the foundation for healthy communities and a sustainable economy. For example, when pairing solutions for energy modernization, diversification, and reliability with emergency preparedness and adaptation designs, the adaptive capacities to system shocks are also built-in, resulting in more resilient communities. To be more specific, by diversifying the ways electricity is generated and distributed, such as through solar, wind, and other renewable sources of energy that can separate the grid into smaller regions, we can reduce emissions while isolating areas from system-wide shocks and can reduce the duration and frequency of power outages from storms in the process. With the impacts of current greenhouse gas emissions *"baked into"* the climate system, investments to reduce emissions now while also adapting to near-term impacts is prudent and practical.

Alignment with the Maine Climate Action Plan Goal to Advance Equity through Maine's Climate Response

The Maine Climate Council is working to ensure the benefits of climate adaptation projects are shared across communities. This started with a Mitchell Center report on Assessing the Potential Equity Outcomes of Maine's Climate Action Plan: Framework, Analysis and Recommendations, Senator George J. Mitchell Center for Sustainability Solutions, September 2020 (PDF) which led to the formation of an Equity Subcommittee (Maine.gov) and an in-depth process of providing equity-focused recommendations to shape the implementation of Maine's four-year climate action plan, *Maine Won't Wait*, December 2020, Maine.gov (PDF).

The CRW draws from the Mitchell Center's report to define equity in the following way:

"Equity takes into account the fact that systems of oppression keep certain people from accessing resources, and an equitable system seeks to provide increased resources to marginalized and disadvantaged communities. The risks and effects of climate change disproportionately fall upon people of color and low-income populations. It is, therefore, absolutely critical that policies intended to mitigate climate change or increase adaptive capacity to its impacts do not exacerbate existing burdens and, wherever possible, increase wellbeing and address the root causes of inequality."[5]

The Mitchell Center report provides an equity framework that can help guide community resilience and climate adaptation planning. This framework highlights the need to pay attention to (1) the social impacts of any proposed project and/or climate change impact, including changes in wealth, health, and accessibility; (2) types of **vulnerable populations** and impacts on financial, social/demographic, and geographic vulnerabilities; and (3) **participation and inclusion**, including whose voices are represented and if participation is accessible, adaptable to the needs of different groups, and where participation meaningfully influences a project or plan. The focus on participation and inclusion is also often described as procedural equity.

2.5 Principles of Resilience for Community Leaders

As community leaders and public officials establish climate initiatives, create goals, develop plans, and engage in greater depth on topics of resilience, adaptation, and climate/hazard mitigation, it may be helpful to acknowledge that the processes of good governance for climate change likely mirror many practices of effective community governance already in place at the local level. The examples below are guiding principles and considerations for your community's engagement in climate change resilience and adaptation.

Guiding Principles:

Provide leadership: Ensure that the impacts of climate change and extreme weather are considered across decisions in local government and civic life.

Develop guidance: Create common objectives, principles, and evaluation criteria for project and program review. Ensure the overarching guidance is integrated into governance, organizational structure, and coordination across partners.

Reduce vulnerabilities: A first step toward adapting to future climate change is reducing vulnerability and exposure to present climate variability.

Engage for synergy: Significant co-benefits, synergies, and tradeoffs exist between mitigation and adaptation and among different adaptation responses; interactions occur both within and across regions.

Center climate co-benefits: Often, municipal operations or routine maintenance of public infrastructure can be adapted to further incorporate projected extremes of climate change (e.g., drought and heavy precipitation, summer heat waves, or storm surge on top of sea level rise. Accordingly, considering climate change across municipal activities can yield climate co-benefits and may have only marginal additional upfront costs when compared to non-climate-friendly designs. Incorporated climate resilience is a co-benefit to routine activities. Simultaneously, many mitigation and adaptation approaches to climate change yield other community and environmental benefits. For example, urban shade trees planted for heat waves benefit community development and capture carbon, electric school buses reduce air pollution, and coastal roads built to accommodate sea level and intensifying storms benefit coastal habitats and Maine's fisheries. Identifying co-benefits clarifies why efforts are valuable across diverse community interests.

Anticipate context-specifics: Decisions are most effective when they are place- and context-specific. No single approach for reducing risks is appropriate across all settings. Employing a place- and context-specific approach (1) requires that those involved in the planning recognize the diverse perceptions of risk, approaches to decision-making, and compounding influences on adaptation; and (2) underscores the importance of coordination across other adaptation or related hazard mitigation and emergency response plans.[6]

Be inclusive: Adaptation planning and implementation at all levels of governance are contingent on societal values, objectives, and perceptions of risk. Recognition of diverse interests, circumstances, social-cultural contexts, and expectations can improve decision-making processes and lead to successful implementation. Processes should fully recognize

and respond to local context, the diversity of decision types, processes, and constituencies including the diversity of approaches taken by intersecting organizations, sectors, and communities.

Maximize resource potential: Existing and emerging economic instruments can foster adaptation by providing incentives for anticipating and reducing impacts.

Design for scale and scalability: Take a landscape-scale approach to decision-making regarding patterns of development, incorporating natural and working lands, past and future uses, natural hazards over time, and environmental, economic, and social impacts.

Common Challenges:

Even when you've considered each of the principles above, projects and community initiatives can face obstacles. Thinking in advance about appropriate planning and carefully considering constraints and funding can help communities to overcome many of the common challenges associated with building long-term resilience to climate change.

Appropriate planning: Poor planning could lead to overemphasizing short-term outcomes or failing to anticipate consequences sufficiently which can result in maladaptation. Additionally, emergency management plans or emergency operation plans can be leveraged for cohesion across adaptation and hazard mitigation actions.

Adequate resources: Limited financial and human resources, governance coordination, impact uncertainty, differing perceptions of risks, competing values, absence of adaptation advocates and leaders, and limited tools to monitor and measure adaptation effectiveness can interact to impede adaptation planning and implementation. However, incorporating climate change into the way projects are designed and implemented can best make use of existing funding, which is a fundamental way to close the gap between adaptation needs and funds available for adaptation.

2.6 Setting Up for Success Using a Resilience Building Framework

Community adaptation to climate change can be approached at multiple levels and starting points. This Resilience Building Framework provides a framework for taking stock of existing actions and aligning those actions so that a more directed approach to resilience can be charted (Figure 1).[7]

Resilience building is a continual cycle of various steps from **taking stock and visioning** at a high level to **assessing, planning**, and **implementing projects** (Table 1). Progress is

often non-linear, and work can be concurrently accomplished at points along the cycle. Each proposal, project, or plan is an opportunity to ask how climate change can be integrated so communities build resilience incrementally.

Adaptation plans often call for shared solutions across sectors and community members. The path to resilience can be about how decisions are made so that climate is included, and who is at the table when those decisions are made.[8] Your work may surround a specific asset that could be made more resilient or an ordinance that can be updated, or it may relate to a planning process that can take stock at a higher level and chart a more resilient future overall. There are also many opportunities in community resilience-building processes to empower additional groups to steward their own visioning and actions that can be an essential component to ensuring more sustainable, equitable outcomes. Overall, each project presents an opportunity, and the Resilience Building Framework can help to clarify essential steps where those opportunities lie to bring about successful, resilient outcomes.

When adapting systems and infrastructure, it is important to draw from the strengths of your town and the skills of local leaders. You can look to neighboring communities to learn about their climate-resilience initiatives. The process requires learning through your work and from peers to constantly improve. This workbook has compiled a starting list of decision support tools, case studies of best practices, and training and networking opportunities from Maine that can support your work in each part of the Resilience Building Framework.

Figure 1. Resilience Building Framework:

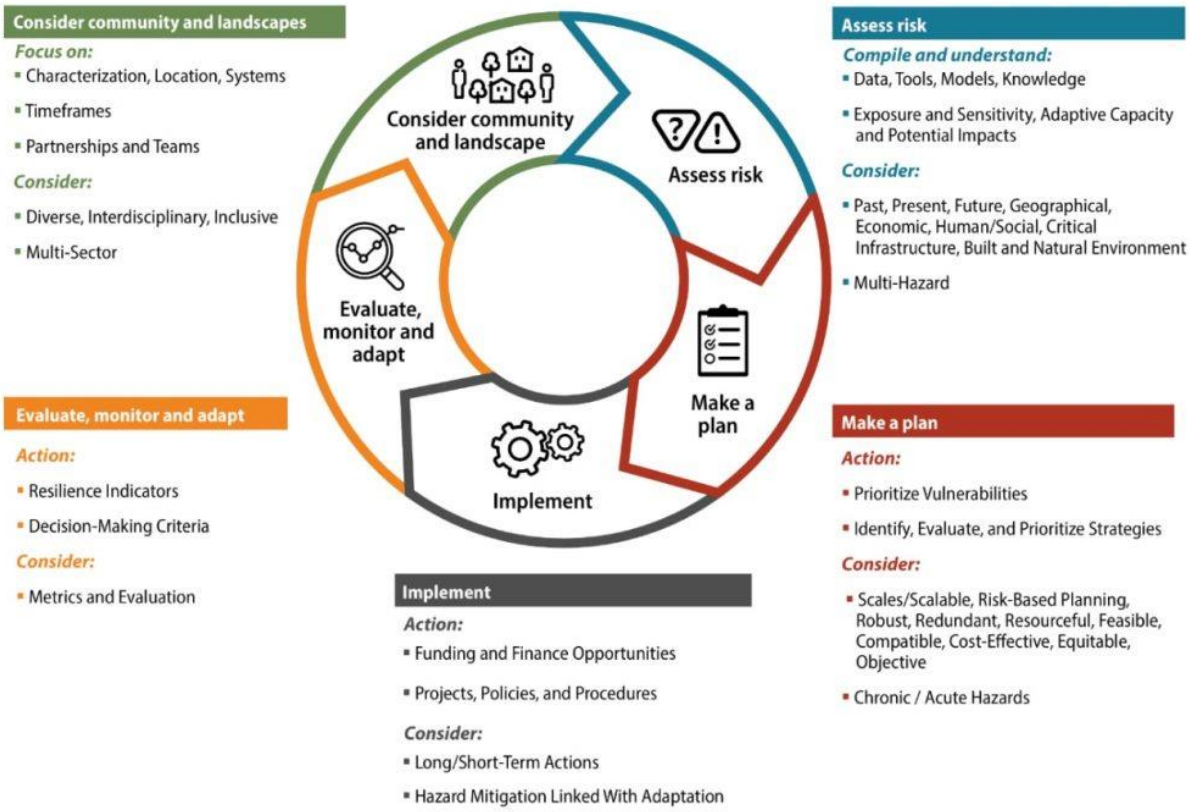

Figure 1. Resilience Building Framework: Click for the text description for the above infographic. (Graphic of cycle made in-house at UMaine for the CCAP Network.)

Table 1: Points of Entry to the Resilience Building Framework (reference Figure 1 above)

Resilience Building Framework		
Consider community and landscapes	Focus on: • Characterization, location, systems • Timeframes • Partnerships and teams • Decision-making criteria	Consider: • Diverse, interdisciplinary, inclusive • Multi-sector

Assess risk	Compile and understand: • Data, tools, models, knowledge • Exposure and sensitivity, adaptive capacity and potential impacts	Consider: • Past, Present, Future, Geographical, Economic, Human and Social, Critical Infrastructure, Built and Natural Environment • Multi-Hazard
Make a plan	Action: • Funding and Finance Opportunities • Projects, Policies, and Procedures	Consider: • Long and short-term actions • Hazard mitigation linked with adaptation
Implement	Action: • Funding and Finance Opportunities • Projects, Policies, and Procedures	Consider: • Long and short-term actions • Hazard mitigation linked with adaptation
Evaluate, monitor, and adapt	Action: • Resilience indicators • Create new or adapting existing ways to track progress, evaluate process, and measure success using resilience outcomes metrics	Consider: • Metrics and Evaluation
Resilience building is a continual process. Progress is often non-linear with work being accomplished at different points in the process.		

This figure provides an example of how a project can fit within the Resilience Building Framework. Working on projects that are specific to a place, such as improving a road or building, may inspire interest in building structures that are resilient to climate forecasts (Figure 2, Inner Circle). A community's broader vision for well-being (Outer Circle), such as having thriving working waterfronts or available emergency services during storms, can lead to assessments and implementation of climate-ready infrastructure and operations.

Specific funding opportunities and/or collaborations with climate adaptation specialists may initiate climate resilience efforts, leading to both specific projects and work to build consensus for a broader community vision.

As communities work on climate resilience, the impacts and processes resulting from their efforts will overlap. Communities may initiate a climate adaptation process based on unique circumstances, specific projects, outcomes, and/or priorities. While the workbook follows a linear outline, it acknowledges that this is not always what happens in practice.

Graphic: Cited from the EPA Regional Resilience Toolkit.

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[4] Definitions pages 109-110 Maine 2020 Climate Change Action Plan, *Maine Won't Wait,* December 2020, Maine.gov (PDF).

[5] Silka, Linda, Sara Kelemen, and David Hart, 2020. Assessing the Potential Equity Outcomes of Maine's Climate Action Plan: Framework, Analysis and Recommendations, Senator George J. Mitchell Center for Sustainability Solutions, September 2020 (PDF) p.6.

[6] U.S. Department of Homeland Security. (2016). Resiliency Assessment, Casco Bay Region Climate Change (Casco Bay Estuary Partnership).

[7] The Framework was developed by the Maine Climate Change Adaptation Providers Network to aid climate action efforts by providing orientation to a sample process that is informed by best practices identified through a variety of state and regional climate resources. This work continues earlier development within Climate Adaptation and Resilience Planning for New England Communities: First Steps & Next Steps (2016) developed by the NEEFC that presents planning tasks, guidelines and tools, and a suggested approach as an extension of what local governments already do. Report available on the University of Southern Maine Digital Commons website.

[8] Sample decision-making criteria are provided in Section 4.8 Resilience Assessment Criteria of the workbook.

3: Data, Resources, and Decision Support Tools

Internationally and nationally, there is a multitude of resources available to support climate change adaptation and resilience. Table 2 compiles many relevant resources and decision support tools developed by the State of Maine, Maine-based non-profit organizations, regional organizations, as well as select federal and private sector resources. Links will direct you to those resources. Checkboxes indicate the usefulness of each tool in the five-stage Resilience Building Framework: consider community and landscapes; assess risk; make a plan; implement; and monitor, evaluate, and adapt.9 This is not an exhaustive list of the available resources. Identifying which tools best fit your project may be best answered through experts that are focused on your topic of interest.

Additional decision-support information, not found in Table 2, that can better suit your needs, may be available in the related section of your topic of interest within this workbook.

Table 2: Decision support tools and resources and possible applications in the Resilience Building Framework

Decision support tools and resources	**Resilience Building Framework Phase**				
Tools and Guidance for Climate Preparedness in Maine	**Community and Landscapes**	**Assess Risk**	**Make a Plan**	**Implement**	**Monitor, Evaluate and Adapt**
Preparing Coastal Communities for Sea Level Rise (Gulf of Maine Research Institute, C-RISE)	✓				

Climate Change Observatory Network (Southern Maine Conservation Collaborative):long-term climate change photo monitoring program	✓				
Flood Insurance Maps (Maine.gov, Maine DACF) for Maine	✓	✓			
Coastal Hazards Map Viewers (Maine.gov, Maine DACF) for Erosion, Tides, Storms, and Sea Level Rise	✓	✓			
Community Intertidal Data Portal (Casco Bay Regional Shellfish Working Group) Casco Bay nearshore environment	✓	✓			
Coastal Resiliency Maps (Maine.gov, Maine DACF) for Wetlands and Open Spaces	✓	✓			
Beginning with Habitat Maps (Maine.gov, Maine DACF) for Conservation of Wildlife, Natural Communities, and Rare Plants	✓	✓			

Conservation Lands in Maine (Maine.gov, Maine DACF)	✓	✓			
Ecological Connectivity (ecologicalconnectivity.com) in Region	✓	✓			
Road and Culvert Map (Maine.gov, MDOT) for State-Owned Infrastructure	✓	✓			
The Nature Conservancy Coastal Resilience Tool	✓	✓			
Maine Coastal Risk Explorer (The Nature Conservancy) for Habitat, Aquatic Connectivity, and Social Vulnerability	✓	✓			
Weathering Maine Flood Risk Map (Maine.gov, Maine Historic Preservation Commission) of Historic and Cultural Resources	✓	✓			
Lyme Disease Maps (Maine Tracking Network) at the Town Level	✓	✓			
Climate Reanalyzer (Climate Change Institute, UMaine, NSF)	✓	✓			

Climate Change Trends and Data (Maine.gov, Maine DEP) clearinghouse of risk and vulnerability information for Maine	✓	✓			
Adaptation Toolkit, Georgetown Climate Center (PDF): Sea Level Rise and Coastal Land Use	✓	✓			
Maine Flood Resilience Checklist, Maine Coastal Center and NOAA (PDF)	✓	✓	✓		
Risk-based Adaptation Planning (EPA)	✓	✓	✓		
Living Shoreline Site Suitability (Maine.gov, Maine DACF)		✓			
Climate Adaptation and Resiliency Planning for New England Communities (University of Southern Maine Digital Commons) First Steps and Next Steps		✓	✓		
Adapting Stormwater Management for Coastal Floods (NOAA Guide)		✓	✓		

Maine Municipal Climate Adaptation Guidance Series (Maine.gov, Maine DACF): • Transportation (PDF) • Stream Smart Crossings (PDF) • Wastewater Infrastructure (PDF) • Drinking Water (PDF) • Storm Water (PDF) • Comprehensive Planning (PDF) • Shoreland Zoning Ordinance (PDF) • Site Plan Review Ordinance (PDF) • Subdivision Ordinance (PDF)		✓	✓	✓	✓
Maine Municipal Infrastructure Planning Toolbox (Maine DOT) for Stream Crossings, includes Maine DOT Culvert Sizing Guidelines		✓	✓	✓	
Model Ordinance Language for Maine Municipalities: Guidance for Coastal Resilience (Southern Maine Planning & Development Commission)			✓	✓	

New England Stormwater Retrofit Manual, U.S. EPA (PDF)		✓	✓		
Hazard Mitigation Planning (Maine.gov, Maine Emergency Management Agency) – links to County plans			✓		
Wastewater Adaptation (Maine.gov, Maine DEP)		✓	✓	✓	
Stormwater Management (Maine.gov, Maine DEP)		✓	✓	✓	
High Water Marks (U.S. Army Engineer Institute for Water Resources)				✓	✓
Adaptation Decision-Support Tools Clearinghouse (Maine.gov, Maine DEP) Maine Climate Hub, 11 topic areas for sector or cross-sector use		✓	✓	✓	✓
U.S Climate Resilience Toolkit (website) Steps to resilience: 1. Explore hazards, 2. Assess vulnerability and risk, 3. Investigate options, 4. Prioritize and Plan, and 5. Take Action	✓	✓	✓	✓	✓

Resilience Metrics Organization			✓		✓

4: Assessment, Planning, Implementation, and Evaluation

The Assessment, Planning, Implementation, and Evaluation section provides information on several key elements for each of these actions, including decision support information, tools, and guiding questions. There are existing resources specific to Maine that can support these processes, and it is recommended to refer to them for further information. Sample questions to help decision-makers understand how natural hazards impact their community and identify resilient courses of action are also available in Appendix E: Sample Risk Assessment Framework and Guiding Questions. These questions can be used at the start of a project, for evaluation during the project, or after completion to determine if objectives were met. The questions are a starting point and can be expanded upon.

4.1 Introduction to Vulnerability Assessment and Adaptation Planning

Communities must account for climate change in their ongoing design and management of systems and infrastructure due to continually changing conditions. Although there will be opportunities for large-scale evaluation of community actions, it is important to integrate climate change considerations into individual projects and plans as they are developed.

As outlined in the US Climate Resilience Toolkit, the five "Steps to Resilience" are:[10]

1. Explore Hazards
2. Assess Vulnerability and Risk
3. Investigate Options
4. Prioritize and Plan
5. Take Action

Vulnerability refers to the sensitivity of communities and the built and natural environment to climate change. Risk is closely related to vulnerability and refers to the magnitude, extent, or probability of harm from specific hazards. Identifying where communities are vulnerable, as well as the extent of the risks, are important steps in developing strategies that make a community resilient. Uncertainty analysis is a means of recognizing the limits of scientific knowledge about any climate change projection and what is unknown about projected risks. Recognizing uncertainties helps prepare a community to respond to unanticipated changes as they occur, particularly by taking actions that benefit the community under different scenarios.

Select considerations included from the Municipal Climate Adaptation Guidance Series (2017):

- Infrastructure built to withstand conditions based on historical data may no longer be sufficient for anticipated future climate conditions.
- Reacting to emergencies without adequate preparation is more expensive than responding based on good preparation.
- Municipalities are more likely to undertake climate resilience and adaptation planning when this work can be integrated into existing municipal efforts and priorities, and when it is based on data appropriate for use at the local scale.
- To address the impacts of climate change, a community first needs to determine its level of vulnerability. This is called a vulnerability (or impact) assessment.

As an example approach, the **Greater Portland Council of Governments** has initiated **Sustainability Data and Mapping** work using census data, future flood mapping, and sea level rise projections to identify high-risk areas throughout the region that are more prone to flooding due to projected climate change impacts. This data can support targeted community outreach and engagement to identify at-risk assets and prioritize resilience projects.

4.2 Natural Hazards in Maine

Natural hazards in Maine might include climate changes that are observed and likely to continue, such as:

- Severe Summer Weather
- Severe Winter Weather
- Flooding
- Wildfire
- Drought
- Hurricane
- Erosion
- Earthquake
- Landslides (Mass Wasting)

As described in the State Hazard Mitigation Plan, (Maine.gov, Maine Emergency Management Agency) (PDF), many natural hazards can occur during a single hazardous weather event. For instance, hurricane events introduce the hazards of storm surge, wind,

inland flooding, and tornados, while blizzards introduce the hazards of wind, snow, and ice. Furthermore, natural hazards tend to occur in seasonal groups.

If developing a **community-wide assessment**, a multi-sector and multi-hazard approach is best. If developing a specific **infrastructure assessment**, it may be sufficient to use only a multi-hazard approach.

Impact assessments have been conducted in Maine that document the effects of climate change on the daily lives of Mainers and Maine communities. The following reports, and the literature referenced within, offer our most up-to-date scientific assessments for Maine:

Scientific Assessment of Climate Change and its Effects in Maine: The Maine Climate Council's Scientific and Technical Subcommittee final report is part of the State Climate Action Plan and summarizes the impacts of climate change in Maine and how it might impact our state in the future.

- Scientific Assessment of Climate Change and its Effects in Maine report (Climate Council of Maine) (PDF). Read the report online in a flipbook format (Online Flip html5).
- Maine Climate Science Dashboard (Maine.gov, Maine Climate Council)

Maine's Climate Future: The Maine's Climate Future Reports (UMaine Climate Change Institute) are prepared by scientists across the State of Maine and the University of Maine's Climate Change Institute.

- 2020 Maine's Climate Future: 2020 Update, the University of Maine
- 2018 Coastal Maine Climate Futures, the University of Maine
- 2015 Maine's Climate Future: 2015 Update, the University of Maine
- 2009 Maine's Climate Future: An Initial Assessment, the University of Maine

The DEP Climate Trends and Data webpage (Maine.gov, Maine DEP) contains the sources provided in the CRW as well as many others to provide a one-stop directory of the best available data and reports to use while conducting vulnerability assessments. Furthermore, the Maine Risk Assessment Map – Overview (Maine Maps ArcGIS) includes relevant GIS information.

Table 2 in this document includes decision support information and tools aligned with steps of the Resilience Building Framework (refer to the resources checked in the 'Assess

Risk' column for impact reports, trends, and data sources to use for vulnerability assessments).

Guiding questions

- What natural hazards are potential risks to your community or infrastructure?
- What is already known from historic information about those natural hazards and the impacts they have caused on your community or infrastructure?
- What is projected for these natural hazards with climate change in the future that corresponds to your community vision or infrastructure timespans?
- What scenarios create the worst-case events for use in your analysis?
- What data sources or community insights were used in your analysis?
- Did you consult with national, regional, and local experts for the best available information?

4.3 Hazard Mitigation

Hazard Mitigation: Prepare for Current Hazards and Future Emergencies

Alignment with State and Maine Climate Council Strategies

- Strategy A: Embrace the Future of Transportation
- Strategy B: Modernize Maine's Buildings: Energy Efficient, Smart and Cost-Effective Homes and Businesses
- Strategy F: Build Healthy and Resilient Communities
- Strategy G: Invest in Climate-Ready Infrastructure

Hazard mitigation describes sustained actions taken to reduce or eliminate long-term risks to people and property caused by natural hazards. Natural hazards are pervasive and can impact any community regardless of its location, sometimes with little notice. These impacts are only expected to grow with the onset of climate change and the expected increase in the frequency of extreme weather events, including flooding, coastal storm surge, windstorms, and drought.[11] Rather than simply rebuilding what is damaged in each disaster, only to perpetuate the vulnerability of this now-replaced infrastructure, hazard mitigation is intended to break the cycle by emphasizing planning and implementing projects in non-disaster times that can persistently reduce a community's vulnerability to future events. Healthy and resilient communities develop hazard mitigation plans and implement projects identified in those plans to reduce risks to life and damage to property

and the environment. Every $1 spent on mitigation can save $6 in future disaster costs, according to the National Institute of Building Sciences findings.

The goals of mitigation planning, akin to other local planning mechanisms, are means of anticipating and avoiding potential disruptions in community safety, services, communication, and business. Hazard mitigation and emergency management/preparedness are priority items for municipal planning and budgeting due to the pervasive and potentially destructive nature of floods, hurricanes, ice storms, wildfires, and other natural hazards. As a result, hazard planning requires broad input from multiple stakeholders – community members, local/state emergency managers, regional planners, technical experts, and other local, state, and federal authorities. Hazard Mitigation Plans are formal documents reviewed and approved by the Federal Emergency Management Agency (FEMA) to encourage planning activities that reduce long-term risk and make communities eligible to apply for federal mitigation-related funding programs.

Communities are encouraged to look critically at their existing planning framework and align efforts with the goal of building a safer, smarter community. These planning efforts lead to mitigation actions, which can vary significantly from wildfire educational programs to the improved construction of previously flooded road-stream crossings, to relocating homes or critical facilities (hospitals, fire stations, schools, etc.) away from hazardous areas. Incorporation of these plans is specific to each community and depends on the vulnerability of the built environment and the capabilities provided by local emergency management and other critical facilities. In general, concepts of mitigation and emergency management are important planning elements for all land use, transportation, watershed management, natural and cultural resource protection, economic development, climate change, and sustainability.

Relevant and recent case studies of local projects in Maine include:

- Fort Kent Levee Extension, funded by FEMA's Pre-Disaster Mitigation (now BRIC) program:
  Fort Kent celebrates completion of levee project (Fiddlehead Focus), by Jessica Potila, SJVT / FhF Staff Writer, August 15, 2019.
- Lincoln County's recent Hazard Mitigation Plan, update funded by FEMA:
  Lincoln County seeks comments on hazard mitigation plan (Boothbay Register), by Sandy Gilbreath, LCRPC, September 21, 2021.
- Houlton Morningstar culvert improvement project:
  Houlton Town Council receives FEMA grant to replace Morningstar Road culvert

(The County), by Alexander MacDougall, July 29, 2020.

- Willard Beach access project in South Portland:
  South Portland councilors: Willard Beach stairs, ramp costly, but worth it (Portland Press Herald), by Jocelyn Van Saun, December 6, 2018.

Guiding questions

- What geographical areas and populations are likely to be affected in the future due to climate change, and how do these impacts differ from the present?
- What are the specific impacts of climate change on the geographical area and population of interest, and how long into the future are those impacts expected to occur?
- What infrastructure is the most important to ensuring the safety of the town and its residents (e.g., hospitals, evacuation routes, etc.)?
- What built and natural infrastructure can be constructed, improved, or preserved to reduce the impacts of climate change?
- What built and natural infrastructure should be prioritized in terms of making a community more resilient to climate change?

4.4 Community Engagement, Outreach, and Adaptive Capacity

Involving diverse groups and people in a community's planning process is a key element of success for ensuring that plans and intended projects connect with people and places where climate change stands to have the greatest and most adverse impacts. Engaging the community can align plans and projects to reflect the needs and priorities of the people who will be most affected. Finally, engagement, outreach, and education efforts can help strengthen learning, relationship building, and network and community development, and improve adaptive capacities allowing communities to more effectively and equitably adapt over time. See Sections 5.2 and 5.3 for more information on how to best engage with communities.

Education, outreach, and community engagement are necessary to help people learn about, talk about, and plan for climate change impacts in their communities which is why these come first in the above table. These efforts lay the foundation for adaptive capacities, which refers to social abilities like information sharing, learning, network formation, relationship building, the development of shared identities and sense of belonging, community histories and memories, and more. Social abilities allow people to understand

each other, connect with multiple forms of knowledge, and make shared and equitable decisions about how to promote resilience and what to do about climate change.

These social abilities can support more flexible and effective governance. For example, if community leaders want to update their comprehensive plans and include consideration of projected climate change impacts so they can prepare for future emergencies (which would be an example of adaptive governance as resilience criteria and improved emergency preparedness as an outcome), people within that community need to understand what those projections are (i.e., improved scientific knowledge) and how different groups of people are more vulnerable to the changes than others (making equity a priority).

Guiding questions

- What does your community care most about?
- What does the community envision for its future?
- Who in this community is on the frontlines of climate change and what are they already doing to build resilience?
- What knowledge do community members have about climate change impacts here? What do community members need to know to make informed decisions about adaptation?
- How can educational materials share scientific information and multiple forms of knowledge about climate change? How can this information be designed to accommodate multiple languages, abilities, and perspectives?
- How can this project create opportunities for learning, relationship building, and networking?
- How can intentional approaches to learning, relationship building, and networking help this community change governance structures, like comprehensive plans, ordinances, and budget priorities? What do community members need to know and who needs to be involved to make governance decisions and changes?
- What do community members identify as priority improvements in local governance?
  What would it take to enact these changes to governance?

4.5 Whole Community Resilience

This section describes foundational considerations and guiding questions that can help shape resilience planning and assessment at all levels, so these processes are equitable and effective and connect with what communities care about most.

One of the reasons that climate change is such a pressing issue is that it is already negatively affecting people who may be the least able to adapt. In places where economic opportunities may be more limited, those who rely on natural resources for their livelihoods are already finding it difficult to adapt to environmental changes. For example, people in Maine communities and Wabanaki Tribes who need to access intertidal ecosystems to dig soft-shell clams or harvest mussels are already finding it difficult to maintain their livelihoods because rising ocean temperatures are leading to growing populations of the invasive green crab, which eat species of shellfish and threaten important fisheries. This ecological change has a clear and outsized impact on individuals and businesses.

Making equity a priority can help address often disparate impacts and consequences of climate change. A focus on equity can also strengthen community efforts by ensuring that project considerations are localized to reflect the interests, perspectives, and priorities of those who live there. It may take additional time to set up a process with inclusive engagement across the community and an approach that signifies diverse perspectives and represents the interests of vulnerable communities. A project that is shaped by this approach will ultimately be more meaningful, effective, and sustainable because it will have authentic and broad community support. Inclusive participation processes can help support learning, relationship building, networks, and related adaptive capacities that strengthen community resilience.

Sample questions related to the criteria outlined in Section 4.8 can help plan, monitor, and evaluate projects. The guiding questions, criteria, and metrics can be applied to better understand and improve projects over time. For example, by initially considering the guiding question “How can we best work with community members most affected by climate change,” project leaders can establish intentional ways of measuring engagement, such as tracking the total number and demographics of participants over time. If community engagement is not considered until later in the project, valuable information may be lost, and opportunities for community engagement may be missed. Guiding questions are intended to improve the meaningful and measurable outcomes of a project.

Guiding questions

- Who in this community is most vulnerable and what are the specific risks to these groups?
- Who is or who will be most affected by changes in our community? How are those groups responding to these changes?

- Will some people be more affected by changes than others, and what helps explain the differences in who will be affected? Consider differences in race and ethnicity, gender and sexuality, income and socioeconomic status, ability, and age.
- What are the specific impacts of climate change on the geographical area and populations of interest, and how long into the future are those impacts expected to occur?
- How can affected communities participate in projects to ensure their voices and concerns are represented?
- Who else in this community is already working with affected groups and how can service providers and affected parties become involved?
- How can projects use a bottom-up and inclusive approach to designing and implementing a project?

In addition to these guiding questions, the Equity Subcommittee has also identified the following cross-cutting recommendations in their February 2022 report Initial Recommendations of the Equity Subcommittee (Maine.gov, Maine Climate Council) (PDF):

General: The state, through its climate communications and equity work, should seek to foster a sense of shared ownership and shared prosperity in the climate transition.

Participation and Procedural Equity: All state policy, program, and other decision-making processes should seek to enable equitable participation from vulnerable and historically underserved communities. Enabling equitable participation might include:

- Paying vulnerable community members for their time
- Providing wrap-around services, such as transportation and childcare
- Increasing access to all programs in languages other than English
- Producing "plain language" guides that help explain particular decisions or decision-making processes
- Including representative participants of impacted groups in program co-design processes
- Utilizing existing social networks to engage communities in state decision-making
- Adjusting meeting times and locations to enable participation by diverse populations

4.6 Socioeconomic and Cultural Consideration

Climate adaptation projects can have co-benefits or positive outcomes for a range of indicators. For example, a project that focuses on planting riparian buffers or forests

alongside streams and rivers to help keep the water cooler and maintain brook trout populations can also strengthen food security and food sovereignty through selective planting. The resilience-related outcomes in this section assess some of the most important values in communities by providing metrics that evaluate the health of local economies, recreational opportunities, food systems, the quality of ecosystems, housing, and the prioritization of support for those who need it most.

Guiding questions

- What are the cultural, social, economic, recreational, and environmental co-benefits that could occur by adapting to climate change in specific ways?
- What and where are the cultural sites that need to be protected from the impacts of climate change? Who needs to be involved in decisions about cultural and historic preservation?
- How is climate change affecting community well-being? How can climate adaptation projects improve community well-being?

4.7 Implementing a Plan, Continuous Assessment, and Budgets

Many of the considerations mentioned above, such as equity, community engagement, education, and outreach, aim to design resilience and climate adaptation plans that generate momentum, support, and community investment for implementation and action. Assessment is a key focus of this section, as it strengthens how engagement can lead to action. By including assessment throughout a project, communities can continuously evaluate progress without necessarily needing to hire an evaluator. With some advanced planning, such as identifying key outcomes and metrics for data collection, continuous assessment can be achieved. This information can be a valuable resource for addressing challenges, maintaining flexibility, adaptability, and inclusivity over time. Assessments should also consider funding, including the capacity to implement a plan and how to secure funding for ongoing efforts.

Guiding questions

What outcomes matter in this community and how will progress towards these outcomes and eventual success be measured? How can these data be used to inform the project as it evolves?

- Does the plan provide clear, well-defined, flexible, and timely strategies for implementation?

- Does the plan have a timeline for when actions need to be completed to ensure project goals are achieved?
- Are specific stakeholders assigned the responsibility for implementing and monitoring each action?
- Do all actions have well-defined cost estimates and corresponding funding sources?

4.8 Resilience Assessment Criteria

This section identifies resilience metrics commonly used to evaluate processes and outcomes. It follows a "backward design" approach that is extensively used in educational settings. This approach enables people to identify their objectives or the project's end goal so they can work backward to determine how they will measure that outcome over time[12]. This approach also applies to developing a planning document. For instance, if project collaborators aim to enhance their emergency preparedness, one metric could be the number of available shelter spaces for displaced families during extreme weather events. Backward design complements the Resilience Building Framework described in Section 2 by focusing on identifying outcomes and evaluation metrics during the "Make a Plan" and "Evaluate, Monitor, and Adapt" phases of the framework.

Using backward design and continuous assessment throughout the life of a project can help collaborators address and adapt to problems or challenges as they arise. For instance, if project collaborators prioritize the outcome of improved community engagement and begin to track the numbers and demographics of people participating in project-related meetings, they can more accurately identify the need to change engagement strategies if participation numbers are low or if key groups are not represented.

This section is organized by six main criteria for assessing resilience, including (1) community engagement, outreach, and education; (2) adaptive capacity and governance; (3) socioeconomic and cultural considerations; (4) vulnerability, risk assessment, and uncertainty analysis; (5) infrastructure; and (6) plan implementation, continuous assessment, and budgets. Each criterion is associated with a set of broad outcome metrics, such as improved awareness and improved adaptive capacity. Each outcome is further associated with a series of metrics that provide specific ways to observe and measure the outcomes (Table 3).

The Climate Adaptation & Resilience Outcomes Tool (CAROT) (UMaine SharePoint Excel) provides a set of resilience criteria, outcomes, and metrics. Communities can use this downloadable Microsoft Excel-based workbook to define and measure success over time. CAROT features dropdown menus that allow users to identify potential resilience metrics

(e.g., number of buildings) for evaluating adaptation outcomes (e.g., improved awareness). Outcomes are further broken down into specific foci (e.g., housing, engagement) to help narrow the list of metrics.

CAROT has three primary spreadsheets:

1. Tool: Drop-down menus for stakeholders to better navigate the metrics list to help stakeholders identify potential metrics;
2. Full Metrics List: The full list of climate adaptation outcomes, metric categories, metrics, and their respective sources; and
3. Sources: A reference list and description of the sources the metrics were obtained

Most users will only use the 'Tool' tab. However, the other tabs have been included for transparency and completeness. Please note, the Tool needs to be downloaded for the features to work properly.

As mentioned in Section 2, equity is a fundamental priority. This approach aims to integrate equity across all criteria rather than treating it as a stand-alone category. This workbook accomplishes this in two ways. First, it includes equity-related metrics on the full metrics list spreadsheet, which are based on the three equity categories described in the above framework: social impact, vulnerable populations, and participation and inclusion. For each category, metrics are available to assess equity by using specific practices such as collecting demographic information, providing educational resources or emergency notifications in multiple languages, or prioritizing climate change-related efforts (education, funding, projects, etc.) for underrepresented or minoritized groups.[13]

Table 3: Example resilience criteria, outcomes, and metrics within CAROT

Resilience Criteria	Outcome	# Metrics
Community Engagement, Outreach, and Education	Improved awareness	58
	Improved community characteristics	69

	Improved engagement	13
Adaptive Capacity and Governance	Improved adaptive capacity	5
	Improved emergency preparedness	33
	Improved scientific knowledge	5
	Improved climate change mitigation	21
	Improved zoning	3
Socioeconomic and Cultural	Improved economic resilience	12
	Improved recreation opportunities	17
	Improved food security	12
	Improved ecosystem health	46
	Improved housing resources and infrastructure	19

	Improved resources for impacted populations	7
Vulnerability, Risk Assessment, Uncertainty Analysis	Reduced flood risk	71
	Reduced impacts on water quality	19
	Reduced mortality, morbidity, and disease	6
Infrastructure	Improved infrastructure	16
Plan Implementation, Continuous Assessment, and Budgets	Improved monitoring	7
	Improved planning	49

[10] The vulnerability assessment process covered in the Municipal Climate Adaptation Guidance Series (2017) stems from US CRT "Steps to Resilience" framework. The 2017 Guidance Series was developed collaboratively by the Municipal Planning Assistance Program of the Maine Department of Agriculture, Conservation and Forestry, Blue Sky Planning Solutions, and many of Maine's regional planning organizations to emphasize the importance of becoming familiar with the risk and vulnerability process for all municipal decision-makers tasked with climate change action.

[11] Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (PDF)

[12] Grant P. Wiggins & Jay McTighe (Eds.). (2005). Understanding by design (2nd ed.). New York, NY: Pearson.

[13] The information in the equity metrics column provides a sample of the type of information that can be included to assess equity commitments. More work is needed to reduce the total number of metrics and further specify what equity means in practice for any community. When selecting outcomes and metrics, project collaborators should tailor metrics and questions to consider social impacts, vulnerable populations, and/or participation and inclusion factors that are relevant in their communities to further shape how equity-related outcomes are measured.

5: The Importance of Collaboration and Partnerships

Alignment with State and Maine Climate Council Strategies and Community Actions (Community Resilience Partnership)

- Engage Maine People:
  - E1 – Establish or recognize an official committee of community stakeholders.
- Increase public awareness of climate change impacts and opportunities to take action:
  - E2 – Create a climate change education, outreach, and engagement program, focusing on mitigation and adaptation for residents and businesses.
  - E3 – Amplify public health advisories for climate-related health and weather events, such as air quality advisories, extreme heat or cold events, extreme storms, power outages, waterborne disease outbreaks, harmful algal blooms, vector-borne disease trends, etc.
  - E4 – Engage youth in resilience, clean energy, and energy use reduction.
  - E5 – Engage populations that are vulnerable to climate impacts in resilience, clean energy, and GHG emissions reduction.
- Engage the business community and recognize climate leadership:
  - E6 – Create and support an energy reduction campaign or challenge among businesses.
  - E7 – Initiate a community bulk purchasing program with a vendor, or vendors, to provide low-cost equipment such as heat pumps and solar for interested residents and businesses.
- Strategy F: Build Healthy and Resilient Communities
- Strategy H: Engage with Maine People and Communities about Climate Impacts and Program Opportunities

Building relationships and collaboration within a community is essential for successful climate adaptation. Adaptation success hinges on regional collaboration to expedite the implementation of tested solutions and to avoid maladaptation. Working collectively can reduce overall costs and time for policy and program implementation. Collaborative frameworks also provide leaders with access to successful models, so they do not have to reinvent.

Furthermore, it is well documented that climate changes are disproportionately impacting vulnerable populations and exacerbating underlying inequities. Equity is critically important and must be a central consideration in public engagement and decision-making. By working with community members directly, shared solutions can be charted which increase the likelihood of removing inequities or at minimum reduce the likelihood of actions that could further exacerbate them.

Inclusive collaborations can also support participatory budget processes, bringing together community officials with residents and business owners in planning and project scoping and design, so when the final budget vote does happen on a specific project that was years in the making, there might also be a higher likelihood of financing or funding support getting approved. And finally, collaborative efforts are a way to expand resources and can help increase capacity of staffing and funding, which are the most common underlying barriers to implementing climate actions in Maine.[14]

5.1 Outreach

Whether your community is addressing climate adaptation through existing avenues or a new plan or regional partnership, community engagement is key to understanding local perceptions, beliefs, and knowledge. This section outlines key steps in the process to effective stakeholder participation. Much of this content is derived from a publication by the NOAA Coastal Services Center, Introduction to Stakeholder Participation, 2015 (NOAA Office of Coastal Management Digital Coast), which can be downloaded online.

Once a project or process has been identified, one of the first steps is to consider when stakeholder participation is needed. There are a number of approaches, from scoping before a project starts, to incremental outreach events throughout the course of a project, and final meetings to report out or make decisions. It is important to consider the time and materials needed, as well as what data or information resources are necessary for informed participation.[15]

The second step is to identify stakeholders, which are generally defined as anyone who has an interest in or is affected by a decision. Conducting a thorough stakeholder analysis can help identify who the stakeholders are for a particular issue, as well as start to identify what their positions and interests are on the issue. A stepwise approach to conducting a stakeholder analysis is included in a NOAA publication, Social Science Tools for Coastal Programs: Introduction to Stakeholder Participation (NOAA) (PDF).

The third step is to define the process elements of your stakeholder engagement plan. There are a number of approaches that can be considered to tailor your project. Table 4 highlights key features and process elements, which are described further in the NOAA publication.

Table 4: Features and Process Elements of Successful Participatory Processes

Features	Process Elements
Active participant involvement	• Opportunity for involvement • Early involvement • Motivated participants • Influence over the final decision
Decisions based on complete information	• Best available information exchange • Constructive dialogue • Adequate analysis
Fair decision-making	• Transparency • Representative participation
Efficient administration	• Cost-effective • Accessible • Limited influence of sponsor

Positive participant interaction	• Positive social conditions • Constructive personal behavior • Social learning
Dalton 2005 as cited in NOAA 2015	

Before starting any community engagement process, it is important to decide how public input will be utilized in decision-making and project implementation and to ensure clear communication with participants.

Once stakeholder audiences have been identified, there are numerous methods to solicit input. Each method has its applications for different issues and considerations for accommodating diverse stakeholders. Methods range from interviews, open houses, surveys, public hearings, workshops, field trips, and even more formal referendum. The NOAA publication Social Science Tools for Coastal Programs: Introduction to Stakeholder Participation (NOAA) (PDF) summarizes common stakeholder participation techniques.

Once a plan to engage stakeholders has been carried out, it is important to evaluate the success and outcomes of the outreach initiative. There are many examples of criteria, and the NOAA publication describes the two more common categories: process criteria, which relate to the strength of process elements in a stakeholder participation process; and outcome criteria, which relate to the outcomes of results of stakeholder participation.

In summary, it is important to follow the steps outlined in this section as you are developing your stakeholder engagement plan for a particular project. This type of work takes more time and planning, although if conducted properly, should yield more inclusive, informed and thoughtful results. As this work is conducted, there are additional tips and techniques in this training resource on planning and facilitating effective meetings on the Introduction to Stakeholder Participation, 2015 (NOAA Office of Coastal Management Digital Coast).

5.2 Community Workshops

If part of the community outreach includes workshops, this section includes questions municipalities and service providers can consider during the planning process. The five

general questions that stakeholders can address in the workshop during discussions are as follows:

- Are there critical nodes in the lifeline functions of your community that could be affected by climate change?
- Are there critical dependencies or interdependencies that could be affected by the projected impacts of climate change?
- Does your community have existing climate change adaptation plans or strategies?
- What are the barriers that prevent active and effective adaptation planning in your community?
- What does your community need to move forward with its adaptation planning efforts?

Specific questions that can be used during workshop discussions are included in Appendix C Example Questions for Community Workshops.

5.3 Case Studies of Maine Community Collaborations

The case studies described in this section include a diversity of collaborative initiatives, from multi-town and regional resource-intensive projects to projects in individual and rural towns with more limited capacity. Each case study highlights the purpose of the initiative, the process used, and the lessons learned. The approach that each town takes needs to be tailored to the community needs, availability of resources (staffing, committees/volunteers, and funding), and the level of vulnerability (perceived and/or real).

5.3.1. Neighboring: Portland/South Portland – One Climate Future

The Cities of Portland and South Portland collaborated on an 18-month process to develop One Climate Future website, a roadmap for climate action. The process entailed significant community outreach and engagement, volunteers, a number of municipal staff, a Climate Planning Process Committee as well as a team of consultants. Chapter 3 of the One Climate Future: Charting a Course for Portland and South Portland, January 2021 (PDF) details more about the process and how it was developed.

The Sustainability Managers for each city, Troy Moon, and Julie Rosenbach shared feedback on the overall process for other towns interested in this approach. They stressed the importance of teamwork between the state, cities, homeowners, and other stakeholders. There were synergies to working with neighboring towns, and found it was not "twice the work." Their framing for this initiative was a "people-based plan" around maintaining the

great quality of life into 2050, rather than an infrastructure and energy systems adaptation plan. Their extensive survey work indicated significant support from community members and the respective town councils also supported this initiative. As resilience has a different meaning for different communities, they stressed the importance of defining 'resilience' for your community. The Cities of Portland and South Portland received external grant funding to support the consultants they hired. However, they mentioned that a town does not have to spend tens or hundreds of thousands of dollars to develop a similar plan, as there are many resources that municipalities can draw from and not start from scratch.

The cities are now working towards implementing recommendations from the report through various avenues, including comprehensive plan updates, land use planning and developing resilience overlay zones, and installing high water mark signage throughout the cities.

5.3.2. Multiple towns: GOPIF Community Resilience Pilot Projects

Maine's four-year climate action plan, *Maine Won't Wait*, recommended enhancing state support for communities to build climate resilience, such as by adopting official sea-level rise projections, incorporating climate change in land-use planning, and strengthening public-health monitoring, education, and prevention. Eight Maine communities were selected by the Governor's Office of Policy, Innovation and the Future (GOPIF) to participate in pilot projects for local climate resilience planning, to help them prepare for the effects of climate change and develop climate planning models for towns and cities in Maine. The selected pilot projects are partnerships among the following communities and organizations.[16] The approach for each project is described in this section.

Windham and Bridgton, with the Greater Portland Council of Governments

The Municipal Operations Review and Resilience Standard Setting project in Bridgton and Windham consists of a detailed review of relevant and significant town operational documents (for example, sections of comprehensive plans, key ordinances related to development, capital improvement plans), and identification of key policies, plans, or processes that are ideal for including climate resilience considerations. These operational documents will be prioritized by town staff and one or two key policies, plans, or processes will be selected for development of resilience standards or protocols. The standards or protocols will be developed using best practices and presented to town governing bodies for consideration.

The processes that municipal governments use to plan for future development, upgrade existing infrastructure, engage communities, and deliver services, are the levers by which change can be made. Creating protocols that standardize the consideration of climate change into decision-making will build resilience in Bridgton and Windham. Additionally, integrating them across departments and sectors will support goals identified in existing planning documents in both towns.

Harpswell, Phippsburg and West Bath, with the New England Environmental Finance Center and Casco Bay Estuary Partnership at the University of Southern Maine

The New England Environmental Finance Center (NEEFC) and Casco Bay Estuary Partnership (CBEP) partnered with the coastal towns of Harpswell, Phippsburg, and West Bath (together the 'coastal cohort') to prepare for the effects of climate change and secure initial funding for shared coastal resilience priorities. As leaders of small, peninsular communities reliant on natural resource economies and home to aging populations, town administrators and staff sought to better understand climate impacts like sea level rise, storm surge, flooding, and erosion and associated adaptation strategies and funding sources.

Over six months, CBEP and New England EFC piloted a three-part workshop series with the coastal cohort to identify community assets (physical, ecological, social), understand local climate-related hazards, vulnerabilities, and risks affecting those assets, and brainstorm and prioritize actions that build community resilience. Workshops included opportunities to hear directly from community members representing local conservation commissions, land trusts, and the shellfishing industry, as well as guest speakers on technical, scientific, planning, and funding-related topics and approaches. In parallel to the workshops, each town worked through a step-by-step vulnerability and risk assessment tool adapted from the U.S. Climate Resilience Toolkit to produce a prioritized list of vulnerable community assets, which informed subsequent town-specific and cohort-wide adaptation strategies and project ideas.

Participating in this facilitated process formed new relationships and established a foundation for regional collaboration, which led the three towns to craft a joint proposal for funding to advance shared priorities. The coastal cohort successfully secured funds from the Maine Governor's Office of Policy Innovation and the Future for engineering services to assess three town landings/wharves and their vulnerability to current and projected sea level rise, storm surge, and King tide events to inform a maintenance and upgrade plan for improved resilience. Preliminary designs and cost estimates resulting

from these analyses in September 2022 will position the towns to jointly seek additional state or federal funding for implementation, with assistance from New England EFC and CBEP.

Caribou, Washburn, and Fort Fairfield, with the Northern Maine Development Commission and The Nature Conservancy in Maine

The Northern Maine Development Commission (NMDC) subcontracted with The Nature Conservancy (TNC) and facilitated three Community Resilience Building (CRB) workshops and one regional roundtable in the central Aroostook region. The three communities benefiting from this project were Washburn, Caribou, and Fort Fairfield. A common feature is that they are all located in the Aroostook River watershed and the river is an integral part of their downtown.

The objectives of the CRB workshops were to identify top hazards; define current strengths and vulnerabilities; and identify and prioritize action steps that address land use, planning, and hazard mitigation efforts, among others, within each community. Emphasis was also directed to identifying societal needs and vulnerable populations that are impacted by the top hazards within the community. In addition, participants at each workshop had the opportunity to discuss infrastructural, societal, and environmental strengths and vulnerabilities and develop and prioritize actions that help to reinforce those strengths or reduce stated vulnerabilities. The CRB workshop also focused on ensuring that all participants were heard and contributed. This helped to strengthen relationships and trust, which are critical for the subsequent implementation of the prioritized actions from and across each of the three communities.

It is anticipated that prioritizing community actions will eventually lead to the development of, or amendment to, stronger comprehensive plans, ordinances, or capital investment plans. This aids in the development of infrastructure designed to reduce the impact of potential hazards which may lead to the identification of low-risk areas within each community where development should occur when paired with plans for sheltering and communication. During the process, this occurred while the Aroostook Emergency Management Agency worked with each community on early warning communication improvements.

Across all three communities, one of the prioritized action items was the loss of windbreaks along major transportation routes. Increasing wind events, particularly after winter storms, have created snow drifting issues, which cause road closures and strain winter road maintenance budgets. The lack of windbreaks also increases soil erosion and increased

runoff that often carries agricultural chemicals. Municipalities need to adapt to public safety and environmental issues resulting from climate change. Because of our long winters, public works crews are well-prepared to handle normal snowstorms, and municipal budgets are well-funded for winter road maintenance. However, with changing winter weather patterns and changing conditions on the ground, these budgets are strained, public safety is compromised, personal injury has increased, and road closures are far more commonplace. The need to increase the number of windbreaks is paramount to assist with these issues.

In recent years, stronger winds from storms and their aftermath have created whiteout conditions. This is exacerbated by the region's long expanses of open space, often with no

windbreaks. In a recent storm, Caribou, Fort Fairfield, and Washburn received a relatively small amount of snow (10-12 inches) but very high winds. Local, County, and State Police received over 400 calls for assistance ranging from personal injury accidents to stranded motorists.

Additionally, after-storm winds have caused public works departments to work overtime plowing areas that continually drift. This results in increased use of fuel and a shortening of equipment life expectancy. The goal of this project is to increase the number of windbreaks (living fences) in areas where snow drifting is occurring. It is also intended to reduce the resources and time needed to clear roads during windy but non-snow events.

More information from each of these pilot studies will be available on Maine.gov's Governor's Office of Policy Innovation and the Future (GOPIF) website when finalized.

5.3.3 Regional: Southern Maine Planning and Development Commission Regional Sustainability and Resilience Program

Southern Maine Planning and Development Commission Regional Sustainability and Resilience Program (SMPDC)'s Regional Sustainability and Resilience Pilot Program works to foster more sustainable and resilient communities by leveraging regional collaboration to enhance the effectiveness of local government action. This pilot Program started in 2019, and now SMPDC is leading several projects and initiatives described in this section.

SMPDC is working with ten communities to develop a regional resilience plan. This initiative builds off of a vulnerability assessment conducted with six towns: Kittery, Kennebunk, Kennebunkport, Ogunquit, Wells, and York. The Program conducted a comprehensive assessment of individual town and regional actions taken to date to establish a baseline of

sustainability and coastal resilience efforts. Each of the towns was evaluated using the same strategies and indicators. Results and findings from this regional assessment are summarized in a report published in July 2021: Getting there from here: a baseline for advancing climate action in Southern Maine: Regional Sustainability and Resilience Program (SMPDC) (PDF). This report shares successful strategies for other towns embarking on similar initiatives. Review the report for more details and examples, although they found that municipalities tend to make more progress on actions when:

- The action is incorporated into town long-term planning priorities
- The town has a committee that advises, directs, and champions resiliency efforts
- Outside funding is available for work on the action
- Community partners support the town's efforts

On the other side of the equation, they found that there are common barriers and challenges that limit the towns' ability to implement actions, including:

- Lack of municipal staff expertise, capacity, and training on sustainability and resilience principles
- Low community engagement/participation
- Insufficient outside funding
- Lack of technical expertise and guidance
- Minimal State guidance and directives
- Limited municipal budgets
- Low prioritization of issues by municipal governing bodies
- Resistance to regulatory approaches

SMPDC, along with project partners at Wells Reserve, GEI Consultants, and Rbouvier Consulting developed Tides, Taxes and New Tactics: Planning for Sea Level Rise and Coastal Adaptation in Southern Maine (SMPDC). This project is investigating municipal-level economic and social impacts of sea level rise and storm surge hazards and developing locally relevant adaptation and resiliency planning strategies that address local and regional vulnerabilities.[17] The project uses local sea level rise projections, storm surge modeling, municipal geospatial data, and population and demographic information to complete a GIS-based socio-economic vulnerability assessment of coastal flood hazards.

The assessment is generating valuable information about flooding impacts on coastal property and populations, the assessed value of the impacted property, associated implications for the municipal tax base, and impacts on the local and regional economy. The assessment findings inform the development of locally relevant and tailored

adaptation, mitigation, and resilience strategies that municipalities can employ to protect people, property, and natural resources from the impacts of coastal flooding now and into the future.

5.3.4 Regional: Climate Ready Casco Bay

The National Fish and Wildlife Fund (NFWF) Coastal Resilience project in the GPCOG region is a capacity-building and planning project that will engage 10-12 vulnerable Casco Bay coastal municipalities in a critically important collaborative planning initiative that will produce actionable resilience projects and address environmental, social, and economic issues from a regional perspective. Ultimately, one regional coastal resilience plan, plus a pipeline of individual green/nature-based resilience solutions will be produced that when implemented will reduce the impacts of climate change on habitats and communities.

5.3.5 Community Intertidal Data Portal

The Greater Portland Council of Governments and the Southern Maine Conservation Collaborative serve as fiscal agents for the Community Intertidal Data Portal (ArcGIS), which was created to make intertidal data and information more accessible, foster connections between communities with an interest in the intertidal, and promote a more nuanced understanding of issues within the nearshore environment of Casco Bay. The need for the Data Portal is to support communities as they adapt to the rapidly changing intertidal ecosystem due to the direct and indirect impacts of climate change. Providing these data in a centralized, up-to-date, and visual format will increase accessibility to information needed for planning in the intertidal zone. The primary goal of this project is to help inform municipal coastal planning and climate adaptation, with a focus on the intertidal ecosystem and shellfish conservation. The regional scale of this project in Casco Bay will serve as a template that could expand to other regions or coastwide in the future.[18]

5.3.6 Regional: Better Safe Than Sorry and Social Resilience

The Wells National Estuarine Research Reserve (WNERR) annually hosts the "Better Safe Than Sorry" workshop series — review Case Study: Annual "Better Safe Than Sorry" Workshop Series Inspires, Tracks Action (Resilience Metrics) (PDF) — bringing together representatives from ten Southern Maine coastal communities to learn from each other about how to plan and prepare for coastal storms, sea-level rise, and extreme weather events. The Reserve's Coastal Training Program assists Southern Maine communities by tracking actions taken by local governments in an annually updated spreadsheet to show progress over time. When communities come together every fall, they learn of others'

efforts, discuss challenges, hear about the latest science, and learn new skills. In subtle ways, the action tracking nudges communities to "keep up with their neighbors."

5.3.7 Regional: Social Resilience Project

The Nature Conservancy, Casco Bay Estuary Program, Wells Reserve, University of Maine's Maine Sea Grant and Cooperative Extension, Blue Sky Planning Solutions, Kennebec Estuary Land Trust, and Bowdoin College are collaborating with local communities to increase social resilience from storm impacts.

With changing climate conditions, coastal Maine faces more frequent and more severe weather events that bring flooding, high wind impacts, and damage to road and electric infrastructure in our communities. There are community members and groups who, due to economic and/or social circumstances, will be at greater risk and have fewer resources to respond to and recover from storm impacts. The Social Resilience Project (Wells Reserve at Laudholm) creates dialogue and connections between groups that play a role in preparing for, responding to, and recovering from these events as well as supporting and reducing the impacts on our most vulnerable community members.

This project is focused on strengthening regional connections in eight communities: Harpswell, Brunswick, West Bath, Bath, Phippsburg, Georgetown, Arrowsic, and Woolwich.

5.3.8 Regional: Collaborating Towards Climate Solutions

Collaborating Towards Climate Solutions (CTCS), (Senator George J. Mitchell Center for Sustainability Solutions) began in June 2020 in Passamaquoddy Bay and western Penobscot Bay to address the community's scarce resources for implementing climate resilience projects. The CTCS framework proceeds through a series of activities intended to first learn from communities about current climate change efforts and needs, and then respond to those needs with community-specific and regional responses. The three core objectives that guide the collaboration are to: (1) facilitate relationship building within and among communities and municipal officials, (2) respond to needs with resources and services, and (3) elevate needs for policy solutions. The overall goal is to build relationships at a sub-regional scale by engaging assistance providers to achieve longer-term sustainable community resilience.

Through CTCS, Islesboro and Camden completed Maine's Flood Resilience Checklist. CTCS funded green infrastructure and tree planting efforts in Camden and Rockland, and there is ongoing work surrounding rain barrels and rain gardens with Vinalhaven and Rockland. GIS

efforts through CTCS, in collaboration with Bowdoin College and UMaine Machias, include sea level rise story maps and work to map living shorelines suitability at municipal scales for local decision-making. Aspects of CTCS now continue through the service provider component of the Community Resilience Partnership, through continued student engagement in applied GIS services, through services with the Knox County Emergency Management Agency, and through ongoing collaboration with climate practitioners across various community climate efforts.

5.3.9 Regional Peninsula Tomorrow (Hancock County Planning Commission, HCPC)

Peninsula Tomorrow is a multi-town effort working for the future of the Blue Hill Peninsula. In 2021, communities began working together to address the issues of greenhouse gas emissions, climate change, sea level rise, and community resilience. Their mission is to identify the potential impact of climate change on the Blue Hill Peninsula and explore ways of maximizing mitigation and adaptation opportunities through interlocal cooperation.

Elected and appointed officials and community leaders of nine towns on the Blue Hill Peninsula in Hancock County — Blue Hill, Brooklin, Brooksville, Castine, Deer Isle, Penobscot, Sedgwick, Stonington, and Surry — meet monthly via Zoom as Peninsula Tomorrow. They explore inter-municipal initiatives to enhance energy efficiency and climate resilience. Since the beginning of Peninsula Tomorrow in May 2021, each meeting has featured presentations by subject-matter experts and discussions of state and federal funding opportunities. Congressional delegation representatives and state legislators participate in the monthly meetings.

Successes of the initiative include multi-town support that has helped secure state (and potentially additional congressionally directed spending) to upgrade a wastewater treatment facility that serves multiple regional community lifelines and an ongoing advocacy effort to accelerate and increase funding for infrastructure improvements to the flood-prone coastal roads and bridges. Mitigating wildfire risk in the town's increasingly developed wildland-urban intermix is the objective of the town's application for federal funding for a Community Wildfire Protection Plan.

5.3.10 Individual town – TBD

We seek a case study from a small, rural inland town.

5.3.11 Individual town – TBD

We seek a case study from an individual island or coastal community.

5.3.12 Nonprofit and Community Lead: Sierra Club's Maine Climate Action Teams

Local Climate and Community Action Teams (Sierra Club) are organizing in Maine to implement specific climate actions. At the time of publication, there are over a dozen initiatives in various towns addressing issues from installing solar energy, to developing town energy efficiency plans and increasing or starting recycling programs.

5.3.13 Maine Climate Table

Founded in 2013, the Maine Climate Table is a broad, non-partisan partnership that includes participation from individuals and organizations from the business, nonprofit, philanthropic, and government sectors in Maine. The Climate Table's vision is to create a state-based model for climate initiatives that increases broad civic engagement and leads to climate action. Their primary goal is to engage more people in community-based climate action that will collectively help to reduce climate-changing pollution, support adaptation to the changing conditions around us, and promote measures that will increase the resiliency of Maine's communities and small businesses. The Climate table offers a number of workshops and webinars, as well as coordinating other projects.

5.3.14 A Climate to Thrive

A Climate to Thrive is a 501(c)(3) nonprofit organization working towards energy independence for Mount Desert Island by 2030 through decentralized, local, renewable energy solutions including efficiency, electrification, and renewable energy generation. The group seeks solutions that build community ownership and equity and bring the community together around shared goals and priorities. Campaigns for solar, energy efficiency and electrification are models for sub-regional implementation. Ongoing virtual dialogues hosted by the organization are components of programming within and beyond the MDI community that are building a network of community-driven, solutions-focused climate action throughout the State of Maine.

5.3.15 Directories for Additional Case Studies in Maine and New England

Across Maine, there are hundreds of projects and communities to learn from and to connect with to expedite climate change solutions. Communities in Maine are not alone in taking climate action and should utilize the expertise elsewhere in New England or further abroad. Websites that help with research and peer connections include:

- **Maine Department of Agriculture, Conservation and Forestry, Municipal Planning Assistance Program** – Coastal Community Grant Program, and case

studies. Since 2012, this grant program has provided over $2 million for 78 projects throughout coastal Maine. List of Coastal Community Grant Awards (Maine.gov, Maine DACF) (Excel). Case studies can be found that address the goals of the Maine Coastal Program (Maine.gov, DMR) including, Preparing for Coastal Storms, Erosion and Flooding; Green Infrastructure; Restoring Coastal Habitats; Addressing Effects of Land Use Activity on Water Quality; or, Improving Coastal Public Access; Ensuring Sustainable, Vibrant Coastal Communities.

- **Environmental Protection Agency, Resilience and Adaptation in New England** – The Resilience and Adaptation in New England (RAINE) (EPA) is a database of vulnerability, resilience, and adaptation reports, plans, and webpages at the state, regional, and community It includes information on communities in Maine taking various actions to build resilience. This growing resource contains content searchable by different natural hazard types, specific products of plans where climate change was incorporated, and covers many topics from economics to ecosystems, to government planning, to many more types of specific infrastructure. EPA's Adaptation Resource Center (ARC-X) (EPA) is an interactive resource to help local governments effectively deliver services to their communities even as climate changes. Decision-makers can create an integrated package of information **tailored specifically to their needs**. Once users select areas of interest, they will find information about the risks posed by climate change to the issues of concern; relevant adaptation strategies; case studies illustrating how other communities have successfully adapted to those risks and tools to replicate their successes; and EPA funding opportunities.
- **Georgetown Climate Center at Georgetown University** – The nonpartisan Georgetown Climate Center (GCC) seeks to advance effective climate and energy policies in the United States and serves as a resource to state and local communities that are working to reduce carbon pollution and prepare for climate change.
    - **Adaptation Clearinghouse** – The Adaptation Clearinghouse is an online database and networking site that serves policymakers and others who are working to help communities adapt to climate change. The Adaptation Clearinghouse can be customized to meet your needs by becoming a member. Featured sectors include coastal, ecosystems, energy, public health, transportation, and water.
- **Climate and Adaptation Knowledge Exchange –** The Climate Adaptation Knowledge Exchange (CAKE-X) is an interactive online source of nationwide climate adaptation case studies and resources.

- **Maine Climate Change Adaptation Providers Network –** the Maine Climate Change Adaptation Providers Network (UMaine Extension) website is an inventory of Maine-specific tools, resources, funding guides, and case studies for climate preparedness in our state.

5.4 Statewide Collaborations and Efforts

Maine and Wabanaki Tribal Nations have a legacy of actions to combat climate change in many different ways and contexts. Successes have built upon each other over time yielding achievements that distinguish the work occurring in Maine. Strong relationships have been established and maintained over time, lessons have been learned and shared so that implementing solutions is expedited, and Mainers and Wabanaki peoples have been resourceful and successful at continually navigating and accessing various funding sources to accomplish the work. The key advancements are summarized in this section, and a more detailed history of climate action achievements is detailed in Appendix A.

> **Note for future editions:** This section needs discussion of the negotiations to the Maine Indian Claims Settlement Act and Wabanaki Tribal Nations inherent rights to manage natural resources as a climate adaptation strategy.

5.4.1 Maine State Climate Plans

In 2001, eleven states and provinces within an association of New England Governors/Eastern Canadian Premiers (NEG/ECP), including Maine, developed the first subnational Regional Climate Change Action Plan (RCCAP). In 2003, Maine established goals for the reduction of Greenhouse Gas (GHG) emissions statewide (38 M.R.S. § 576). The Maine Climate Action Plan was adopted in 2004 to meet the reduction goals specified in Maine law. The action plan contained recommended options that would allow the state to meet the reduction goals through cost-effective strategies and actions, and that allow for sustainably managed forestry, agriculture, and other natural resources to sequester greenhouse gas emissions.

In 2009, the Maine Legislature directed the Maine Department of Environmental Protection to evaluate what options the state and its citizens have as we adapt to the impacts of climate change: 124th Legislature, LD 460, "Resolve, To Evaluate Climate Change Adaptation Options for the State" (Maine Legislature) (PDF). The development of *People and Nature Adapting to a Changing Climate: Charting Maine's Course 2010* (Maine's Climate Adaptation Plan) brought together a broad cross-section of Maine people representing

business, trade, agriculture, forestry, health, transportation, and conservation, as well as state and municipal government. More than 70 groups participated in creating the report and working on committees. The report builds directly on the climate impact assessment led by UMaine, *Maine's Climate Future: An Initial Assessment 2009*, which offered an informative and up-to-date summary of climate change effects in Maine. The adaptation plan contained numerous strategies and more than 60 recommendations.

Since 2003, Maine progressed on implementing over 70% of the recommendations in its first Climate Action Plan (LD 845 121st Maine Legislature, First Regular Session, An Act To Provide Leadership in Addressing the Threat of Climate Change, P.L. 237), and over 80% of its recommendations in the Maine Adaptation Plan (2009 LD 460 124th Maine Legislature, First Regular Session, Resolve, To Evaluate Climate Change Adaptation Options for the State), achieving both near-term mitigation goals and improving risk mapping and other decision-support tools development to support communities and industries adapt to impacts. In 2012, the 2010 Adaptation Plan was adopted as the State's working adaptation plan. Agency and sector-specific plans have also been developed (Appendix A).

On June 26, 2019 (LD 1679: 29th Maine Legislature, First Regular Session, An Act To Promote Clean Energy Jobs and To Establish the Maine Climate Council, Public Law, Chapter 476 on – Session – 129th Maine Legislature, An Act To Promote Clean Energy Jobs and To Establish the Maine Climate Council), the Governor and Legislature created the Maine Climate Council which is an assembly of scientists, industry leaders, bipartisan local and state officials, and engaged citizens to develop a four-year plan to put Maine on a trajectory to reduce emissions by 45% by 2030 and at least 80% by 2050. In September of 2019, co-chaired by the Governor's Office of Policy Innovation and the Future and the Maine Department of Environmental Protection, the 39-member Council (Maine.gov, Maine Climate Council) and its supporting bodies, the Science and Technical Subcommittee, and six sector-specific Working Groups started meeting to develop the climate action plan.

On December 1, 2020, the Council delivered the plan — *Maine Won't Wait: A four-year plan for climate action* — to the Governor and the Legislature. An Equity Subcommittee was established in 2021. That same year the State also adopted a carbon neutrality goal by 2045 (L.D. 1429 130th Maine Legislature, Second Regular Session, An Act To Achieve Carbon Neutrality in Maine by the Year 2045, P.L. 517 State of Maine H.P. 1045 – L.D. 1429 An Act To Achieve Carbon Neutrality in Maine by the Year 2045 (PDF)). The Science and Technical Subcommittee produced the most up-to-date Scientific Assessment of Climate Change and Its Effects in Maine, (GOPIF) (PDF) in Maine, analyses/reports (Maine Climate Council)of greenhouse gas mitigation strategies and cost-benefit of adaptation actions

were prepared, and thousands of Maine people (Maine Climate Council) (PDF) offered their concerns, observations, ideas, and encouragement to create the plan.

Maine Won't Wait (Maine Won't Wait (Maine.gov) (PDF); Maine Won't Wait (FlipHTML5); Executive Summary: Maine Won't Wait (Maine.gov) (PDF) contains eight strategies with dozens of recommendations for implementation. Within the entirety of the Plan, there are a total of 67 recommendations across the eight overarching strategies. The strategies within the Climate Action Plan can also serve a dual purpose for communities in Maine by providing areas where specific actions can be taken. These strategies are listed below and are referenced in the relevant sections below.

- Strategy A: Embrace the Future of Transportation
- Strategy B: Modernize Maine's Buildings: Energy-Efficient, Smart, and Cost-Effective Homes and Businesses
- Strategy D: Grow Maine's Clean Energy Economy and Protect Our Natural Resource Industries
- Strategy E: Protect Maine's Environment and Working Lands and Waters, Promote Natural Climate Solutions, and Increase Carbon Sequestration
- Strategy F: Build Healthy and Resilient Communities
- Strategy G: Invest in Climate-Ready Infrastructure
- Strategy H: Engage with Maine People and Communities about Climate Impacts and Program Opportunities

Maine's Climate Action Plan is a blueprint for bold, specific, and immediate action requiring transformational changes in the way Maine produces and consumes energy and incorporates climate change impacts and principles into day-to-day decision-making. Implementing the plan will require a climate-focused recovery from the global pandemic, and a collective effort across state agencies and with individuals, businesses, organizations, and leaders in Maine. Many of the topics and actions included in this Workbook align with strategies and recommendations identified in *Maine Won't Wait*. Best practices presented in this workbook represent areas where communities might inventory their own actions to identify gaps and pursue further action using the resources and experts provided.

5.4.2 Community Resilience Partnership

The Governor's Office of Policy Innovation and the Future (GOPIF) launched the Community Resilience Partnership (Maine.gov, GOPIF) on December 1, 2021. Through grants and direct support to municipal and Tribal governments, the Community Resilience Partnership assists communities to reduce carbon emissions, transition to clean energy, and become

more resilient to climate change effects such as extreme weather, flooding, rising sea levels, public health impacts, and more.

Communities in Maine can join the Partnership individually, or through a regional group, after completing three simple steps including (1) adopting a resolution of commitment, (2) completing a pair of self-assessments, and (3) holding a community workshop to prioritize initial climate resilience and clean energy actions. Participation in the Partnership is open to all municipalities and federally recognized Tribes in Maine.

Communities with a record of climate action may join the Partnership by reviewing past activities, completing the self-assessments, providing proof of a qualifying community workshop, and passing or amending a resolution. Communities yet to begin climate action can choose to complete the steps on their own but may find greater benefit in working with a service provider and neighboring communities to join the Partnership as a group.

Community Action Grants can support two categories of climate action by communities: (1) actions from the List of Community Actions, an approved list of climate mitigation and adaptation activities that align with the strategies of Maine Won't Wait, and (2) other projects proposed by a community that supports capacity building, planning, and implementation projects.

These options offer guidance for communities starting on climate plans and incentivize a baseline level of climate action across the state. They also provide flexibility by allowing communities to choose actions from the List that are most relevant and feasible, while also providing support for community climate and energy priorities that may not appear on the List of Community Actions.

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[14] Johnson, Eileen S., Esperanza Stancioff, Tora Johnson, Sarena Sabine, Haley Maurice, and Claire Reboussin. PDF Download Available on this page: "Preparing for a Changing Climate: The State of Adaptation Planning in Maine's Coastal Communities." Maine Policy Review (DigitalCommons@UMaine), 28.2 (2019): 10 -22.

[15] NOAA Coastal Services Center, Introduction to Stakeholder Participation (2015) (PDF).

[16] Press Release: Eight Maine Communities Selected for Local Climate Change Planning Projects (Maine.gov, Governor's Office of Policy Innovation and the Future)

[17] For specific adaptation strategies, see the policy, land use, project, and funding strategy tables in pages 40-55 in the Tides, Taxes, and New Tactics: Adaptation Planning for the

Impacts of Sea Level Rise and Storm Surge in Southern Maine final report (SMPDC) (PDF), July 2021.

[18] Sara Mills-Knapp, email message to author, December 3, 2021.

6: Integration with Existing Community Activities

Local and Tribal governments and communities have hundreds of projects on their to-do lists. Often these are critical infrastructure improvements that are long overdue. Even status quo upgrades for roads, culverts, water lines, wastewater, stormwater systems, and other public infrastructure have costs that extend beyond existing capital improvement plans. Community decision-makers have the difficult task of selecting only a few efforts from a multitude of needs. The intention of this section is to support towns and Tribes in connecting resilience planning and designing for climate change within existing needs and activities as an extension of what they are already doing.

This section provides an overview of the diverse priorities a community or region should consider when conducting climate action planning or project planning and implementation. Each planning process or project will consistently present opportunities to incorporate climate change science and long-term resilience planning. To streamline this process, it is important to have the right pathways to climate information, access to decision-support tools, processes in place for consensus building, and diverse partners to share leadership when projects extend beyond the capacities of public officials alone. Within each of the subsections for each priority work area or core audience is a synopsis of climate change-related issues, specific best practices to address these issues, and resources to help.

Each subsection starts with a description of municipal priorities and core audiences that could be the focus of climate action planning.

6.1 Community Planning and Economic Development

Alignment with State and Maine Climate Council Strategies and Community Actions (Community Resilience Partnership)

Strategy F: Build Healthy and Resilient Communities

- Plan for Community Resilience:

- F1 – Conduct a community vulnerability assessment that identifies climate risks and vulnerable populations and includes a review of existing plans and policies. Adopt a climate resilience plan that describes high-priority strategies for reducing risk and vulnerabilities (maybe a standalone plan or included in a comprehensive plan).
- F2 – Update the local or county EMA hazard mitigation plan to address changing/future conditions and identify specific strategies to reduce vulnerability and increase resilience to climate change impacts.
- F3 – Develop or enhance early warning systems and community evacuation plans.
- F4 – Develop a storm debris management plan.

- Reduce Flood Risk:

- F5 – Complete the Maine Flood Resilience Checklist.
- F6 – Participate in the National Flood Insurance Program (NFIP).
- Enroll in the NFIP's Community Rating System (CRS) at Class 9 or better, reducing flood insurance premiums for community residents.
- F7 – Achieve CRS Class 6 or better, maximizing flood insurance savings for community residents.
- F8 – Map sea level rise projections in the local or county EMA hazard mitigation plan.
- F9 – Require consideration of sea level rise projections and impacts in planning and permitting coastal development.
- F10 – Adopt freeboard requirements in the special flood hazard area and higher freeboard critical infrastructure and long-lifespan assets.
- F11 – Adopt a low-impact design (LID) standard for stormwater management.

While Section 4 provides examples and approaches to initiate climate action planning, this section focuses on approaches to integrate climate adaptation in existing municipal activities. Each community will need to discuss and prioritize which activity is the right fit and timing for their needs and available resources. Communication between municipal committees, town staff, and the town council or board of selectmen is key to streamlining

these processes. Section 5 includes resources and best practices for community engagement within many different work areas, including for public education.

"Maine municipalities have many existing tools to address resilience to changing climate conditions. Hazard mitigation plans, comprehensive plans, economic development plans, transportation plans, capital improvement plans, zoning ordinances, and site plan review and subdivision ordinances all provide existing platforms. In fact, these plans and ordinances should be interconnected to ensure that the municipality's plans for growth and development and for effective hazard mitigation are supportive of one another. The following section provides brief descriptions of the municipal planning tools that are covered in more detail in individual guidance documents."[19] **Figure 3** depicts the three general types of plans, as well as examples of specific plans that can accommodate climate action planning.

Figure 3. Cascading plans that can be influenced by resilience planning

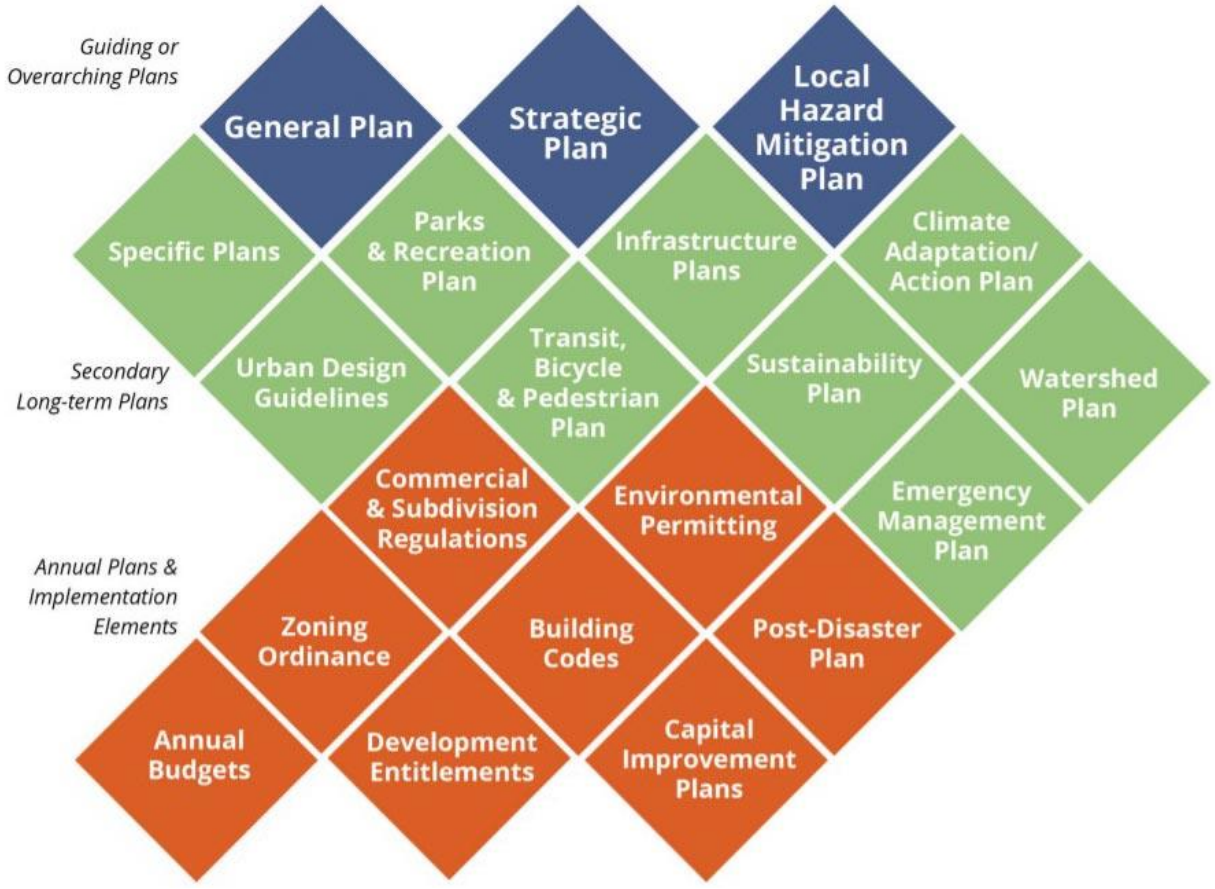

Figure 3. Cascading plans that can be influenced by resilience planning (cited from the Regional Resilience Toolkit: 5 Steps to Build Large-Scale Resilience to Natural Disasters.)[20]

6.1.1 Integrating Climate Adaptation into Comprehensive Plans

"Developing a comprehensive plan is an extraordinarily powerful process through which a community develops a vision for its future along with the strategies to implement that vision." The Land Use and Planning Regulation Act (30-A MRSA, Chapter 187) also known as the Growth Management Act (GMA) sets forth the State's goals for economic growth and natural resource protection. The State relies on municipal and regional plans to support those goals.

Comprehensive plans are also a municipality's 'business plan' – strategies in the plan laid out the municipality's approach to important government functions such as land use regulation, economic development, natural resource protection, capital investment, transportation, recreation, community engagement, and public safety. This is a logical and important place for a municipality to integrate concerns about the impacts of a changing climate.

Enacted in April 2022, LD 1970: 130th Maine Legislature, Second Regular Session, An Act To Implement Agency Recommendations Relating to Sea Level Rise and Climate Resilience Provided Pursuant to Resolve 2021, Chapter 67, P.L. 590: State of Maine, An Act To Implement Agency Recommendations Relating to Sea Level Rise and Climate Resilience Provided Pursuant to Resolve 2021, Chapter 67 (PDF) now implements recommendations from Maine Won't Wait Climate Action Plan by amending the laws governing municipal planning and land use regulation. The changes enable the development of local climate action plans, and incorporation of plans into a municipality's or multi-municipal region's growth management program and could enable land-use ordinance changes. Chapter 590 is further supported through an agency financial and technical assistance program housed at the Department of Agriculture, Conservation, and Forestry.

Climate resilience and adaptation can be incorporated as a separate chapter in comprehensive plans or integrated throughout the document. A comprehensive plan's climate resilience policies and implementation strategies can provide municipal leaders with the basis to budget for, seek grant funding for, and carry out specific actions to increase resilience. For example, a plan's transportation policy to, "Assure culvert capacities reflect trends for increasing storm intensity" can be complemented by a strategy to "inventory and assess existing culverts and prioritize replacement of those that have insufficient capacity for a 50-year storm event." [21]

For detailed instructions on how to integrate climate actions into comprehensive plans, the Municipal Climate Adaptation Guidance Series on Comprehensive Planning (Maine.gov, Maine DACF) (PDF) provides specific examples in each section of a comprehensive plan that is required by state regulation.

Maine's Flood Resilience Checklist (Maine Coastal Program and NOAA) (PDF) is a useful blueprint for crafting a discussion around resilience and adaptation (also see Table 2 for additional decision support tools).

6.1.1.1 Other National Guidance

Municipalities and nonprofit organizations in other states have developed templates and resources for integrating climate adaptation into comprehensive planning. "Comprehensive planning that is done within the frame of climate consciousness can replace the need for a separate Climate Action Plan."[22]

- Climate Change Adaptation through Local Comprehensive Planning (CAKE-X) (PDF) is a guidance document for Puget Sound Communities developed by EcoAdapt in 2017. It provides a rationale for why communities should include climate change in their comprehensive plans and background on expected climate change impacts to the Puget Sound Region. It also includes a model process for incorporating climate change into each element of a plan, as well as a section on plan implementation.

Beginning in 2010, the American Planning Association (APA) developed best practices for comprehensive planning and sustainability. This work, under the project name Sustaining Places, "offers a framework with standards for creating livable, healthy communities in harmony with nature — communities that have resilient economies, social equity, and strong regional ties." Four steps show how to turn those principles into a plan and score the results. Insights from 10 pilot communities add the real-world perspectives of big cities, small towns, and everything in between. Out of that initiative in 2012 came *Sustaining Places: The Role of the Comprehensive Plan*, a guide that makes the case for building sustainability into long-range planning. Now APA has gone further, explaining how to put those plans in place.

- Sustaining Places: Best Practices for Comprehensive Plans (American Planning Association) — This report is a guide that makes the case for building sustainability into long-range planning. It is a resource with principles, processes, and pointers communities can use to forge their own solutions as they meet the greatest planning challenge of our time."[23] More information is available online, including

how to purchase the report on the Sustaining Places: Best Practices for Comprehensive Plans (American Planning Association) page.

6.1.2 Case Studies of Maine Communities' climate action plans

Increasingly, municipalities in Maine are integrating climate adaptation and mitigation measures into comprehensive plans. Different approaches abound, though there are efforts to provide templates for towns and regions to make the process more accessible and streamlined. This section provides a few examples.

Georgetown Comprehensive Plan

The Town of Georgetown updated their comprehensive plan in 2019.[24] This plan used recommendations from the 2015 Climate Change Adaptation Report developed by the Georgetown Conservation Commission. Their comprehensive plan identifies climate change and sea level rise as major risks to the town's future and has specific goals and action items to address those risks.

The plan was developed in collaboration with the University of Maine. Georgetown was one of 30 towns that were reviewed as part of a larger research project. From this collaboration and research, the partners at the University of Maine published a paper in 2019, "Comprehensive plans as tools for enhancing coastal community resilience" (Taylor & Francis Online).

York Comprehensive Plan

In 2013, the town of York and the Southern Maine Planning and Development Commission developed a Sea Level Rise Chapter within their comprehensive plan, with funding from the Coastal Communities Grant Program. The Chapter inventories the best available data on trends in sea level rise and offers the best available predictions for the future.[25] In 2021 while updating the comprehensive plan, the Town of York also developed and is now voting to endorse a climate action plan to help the community to prepare for climate impacts and to meet climate emissions reductions goals.

Kennebunkport Comprehensive Plan

The Town of Kennebunkport and its Comprehensive Planning Committee of finalizing a new comprehensive plan having released a draft in 2021. Climate change is addressed in all relevant sections. "We aspire to a comprehensive plan that puts our community on a sustainable path, one that is responsive to the challenges posed by a changing climate."

More information is available on Kennebunkport 2030: A Citizens' Guide to the new Comprehensive Plan website.

Kittery Comprehensive Plan

The Town of Kittery's Comprehensive Plan 2015-2025 (Volume I: Comprehensive Plan) has a goal and section devoted specifically to coastal resilience. The goal is to: "Establish short, medium and long-term plans to address the effects of climate change, including increased storm frequency and strength, coastal erosion and rising ocean levels, and transition of both public and private energy consumption to low and zero impact methods." To meet this goal, the Plan describes the following objectives:

- Establish plans to address the effects of climate change.
- Reduce energy consumption and transition to low and zero-impact methods.
- Provide education and incentives to protect the environment and improve quality of life.[26]

The Town is now making progress towards this goal and underlying objectives, and with a Climate Adaptation Committee (Kittery, Maine) has started to develop a climate action plan.

We seek examples from inland and Downeast, Maine for the next edition.

6.1.3 Capital Improvement Plans

This is a provisional section that requires content from external contributors.

Capital Improvement Plan Case Studies

This is a provisional section that would benefit from other case studies, including local to Maine, if applicable.

The following example is from Maryland:

- Integrating Resilience into Local Capital Improvement Projects, Best Practices for Maryland's Eastern Shore Communities (University of Maryland Environmental Finance Center) (PDF)

6.1.4 Integrating Climate Adaptation into Ordinances and Zoning

Communities are adept in using ordinances and zoning to encourage the most appropriate use of land in a locality as well as the general welfare of community members. Mechanisms

include floodplain management; zoning (including shoreland); subdivision / Site Plan Review (SPR); stormwater management; and wetlands, sustainability, and shellfish ordinances. These are established approaches that can be used to steer local actions and activities that reduce the risks and impacts of climate change.

In 2022, The Southern Maine Planning and Development Commission (SMPDC) developed a Municipal Guidance Document that outlines opportunities for incorporating coastal resilience measures in existing municipal and land use ordinances. A draft table that provides an inventory of zoning and ordinance options to guide a community's deliberation is in Appendix B. SMPDC is also in the process of developing a Model Coastal Resilience Ordinance.

A few examples of how to use land use ordinances to increase resilience to climate change are included in the Municipal Climate Adaptation Guidance Series Overview document, including links to the specific topics in the series:

- **Zoning Ordinance:** The zoning ordinance is the logical tool to use to manage development in areas vulnerable to the impacts of sea level rise or increased levels of precipitation. Overlay zones can be created in high-hazard areas that set different standards based on the specific type of hazard.
- **Shoreland Zoning Ordinance:** The model shoreland zoning ordinance that most Maine communities have adopted includes a requirement that new construction be elevated a minimum of one foot above the base flood elevation. Several communities in Lincoln County are considering amendments to their shoreland zoning ordinance to increase the minimum elevation to three feet about the base flood.
    - Municipal Adaptation Guidance Series: Shoreland Zoning (Maine.gov) (PDF)
- **Floodplain Ordinance:** Most towns with a floodplain management ordinance adopt the state's model Floodplain Management Ordinance (Maine.gov, Maine DACF). Among other provisions, it requires that new construction within certain flood zones be built to a minimum elevation of 1 foot above the base flood elevation (BFE). However, a municipality has the authority to adopt a higher minimum elevation above BFE to accommodate sea level rise, and several Maine municipalities have done just that.
- **Site Plan Review Ordinance:** A municipal Site Plan Review Ordinance can be used to encourage or require consideration of changing climate conditions in proposed projects. It can be used along a continuum from simply requiring that an applicant consider changing climate conditions to requiring an explanation of how the project

proposal incorporates that consideration to requiring that projects meet certain specified standards related to changing climate conditions. Suggested language is provided in the Model Site Plan Review Ordinance guidance document.
    - Municipal Adaptation Guidance Series: Site Plan Review Ordinance (Maine.gov, Maine DACF) (PDF)
- **Subdivision Ordinance:** Like a Site Plan Review Ordinance, a municipal Subdivision Ordinance can be used to encourage or require consideration of changing climate conditions in the design and development of a new subdivision.
    - Municipal Adaptation Guidance Series: Subdivision Ordinance (Maine.gov, Maine DACF) (PDF)

These approaches can help the community to gradually relocate away from high-hazard areas; ensure that new development avoids climate risks; establish building standards for vulnerable infrastructure to tolerate forecasted water levels for flood and sea level rise; and minimize flood and pollution risks by intentionally thinking about how water moves through the landscape of your community.

Maine Case Studies

This is a provisional section, and we request further examples from across Maine.

- SMPDC Maine Coastal Program: Southern Maine Planning and Development Commission: Developing A Model Coastal Resilience Ordinance to Protect Maine's Coastal Cities, Towns and Residents (PDF), an EV charging station, sustainable road model ordinances, as well as one for MS4 communities
- LCRPC Maine Coastal Program: Lincoln County Regional Planning Commission Sea Level Rise Ordinance Project (PDF)
- Case study – Harpswell Conservation Commission and the Climate Resilience Implementation Task Force
- *Examples from inland Maine requested.*

6.2 Ecosystems, Habitat, and Wildlife

Alignment with State and Maine Climate Council Strategies and Maine Community Actions (Community Resilience Partnership)

- **Strategy E: Protect Maine's Environment and Working Lands and Waters, Promote Natural Climate Solutions and Increase Carbon Sequestration**
    - E2 – Incorporate a goal into conservation plans of conserving 30% of land in the community by 2030 (including undeveloped town property), with a priority on addressing conservation gaps related to high biodiversity areas, undeveloped blocks, and land and water connectivity.
    - E3 – Create or update a watershed plan to identify flooding and water quality priorities and adaptation options.
    - E4 – Develop a natural resource and habitat inventory that includes climate stressors and impacts.
    - E5 – Conserve, revegetate and reconnect floodplains and buffers in riparian areas.
    - E6 – Preserve climate-threatened natural areas such as wetlands, riparian areas, and headwater streams through zoning or other regulations.
    - E8 -Adopt policies that prioritize natural, nature-based or ecologically enhanced shoreline protection for coastlines, rivers, and lakes.
    - E9 – Identify and protect sites for living shorelines and saltmarsh migration areas.
    - E10 – Identify and protect open space in the floodplain to increase flood buffers and community resilience.

Climate change will have broad impacts on Maine's natural and working lands, and the essential ecological functions they provide. For ecosystems, habitats, and wildlife across Maine, climate change introduces a range of new stresses including hotter summers, warming waters, changes in rainfall, the reduction or loss of snow cover, and sea level rise.

Municipalities and Wabanaki Tribal Nations have home-rule authority and autonomy in day-to-day jurisdiction and land use planning that impacts natural resources and habitats. Recent assessments of species and habitat vulnerability and exposure to climate change have highlighted the extent and magnitude of factors that will shape living conditions for Maine's native plants and animals. If plants and animals are to successfully adapt to climate change, they will need access to suitable places to live; they also may need to move around the landscape to respond to changing conditions. Despite extensive predicted changes, the

actions that towns can take to protect ecosystems from climate change mirror long-proven approaches to planning for future growth in concert with maintaining natural ecosystem integrity.

One element of maintaining ecosystem integrity is maintaining "landscape connectivity." Landscape connectivity can play out at very broad scales – facilitating a northward shift in the range of entire species which requires protection of larger linked habitat blocks, and at very local scales – allowing individual animals or small populations to move between local habitat patches. This can include moving to find certain micro-climates such as going to higher elevations, or along stream corridors to cooler and wetter areas. Both scales are critical to support the plants and animals that live in our communities.

Maintaining terrestrial and aquatic habitat connectivity; protecting large habitat blocks; and avoiding impacts to rare and vulnerable habitat features remain tenets of ecosystem resiliency. Integrating ecological function into planning and design is not only good for native plants and animals, but also benefits the resilience of human communities through future cost avoidance, improved air and water quality, and protection of traditional recreation and natural resource-dependent economies.

For example, addressing water quality issues of urban impaired streams, replacing failed road crossing structures, and restoring once-productive intertidal resources are becoming increasingly common and expensive challenges faced by towns and Tribes. These examples of resource degradation likely could have been avoided with prior and more sophisticated environmental planning. Instead, years of incremental stream buffer clearing, increases in impervious surface areas, and poor storm runoff control have led to current degraded conditions. Fortunately, both modern development practices and our knowledge of landscape functions have evolved, and communities can minimize impacts to natural resources. through proactive planning practices. Anticipated changes to global climate and the expected human response, including human climate migration, have expedited the need for robust planning processes that will result in a resilient and connected natural landscapes while still accommodating growth needs.

For communities in Maine, Beginning with Habitat has developed planning tools to help understand where key natural resources and sensitive habitats occur while highlighting opportunities to build greater habitat resiliency through straightforward planning.

Beginning with Habitat (BwH) is a decision-making approach and a GIS mapping-based guidance on how to use these resources to develop an open space plan or take other

actions to support resilient open space in your community – like paying attention to stream connectivity.

In addition to these map-based resources, BwH offers planning assistance, from ordinance tools to model open space plans that can help to make sure natural landscape functions and services persist while we accommodate future development needs. If your town is exploring ways to better protect surface waters, minimize rural forest fragmentation, or simply manage existing town open space to better respond to future conditions, Beginning with Habitat can assist.

Ultimately, BwH empowers decision-makers to guide growth in such a way that the quality of Maine's future, including fishing, hunting, wildlife watching, and outdoor recreation – and all the economic activity it brings to our state – will endure.

For more information on the Beginning with Habitat program and available resources, visit the following links:

- Beginning with Habitat's It all Begins with Habitat page (Maine.gov, IFW)
- Beginning with Habitat's Beginning with Habitat Maps page (Maine.gov, IFW) — Interactive BwH Map Viewers and Data Sets
- Request a presentation, map package, or site visit by our landowner outreach biologist on the Beginning with Habitat Request Form page (Maine.gov, Maine IFW)

Communities that manage town forests or other municipal open spaces should also be aware that climate change may change how our forests look and function ecologically. We are likely to see changes in tree cover, loss of familiar tree species, and an increasing prevalence of invasive species. These changes will impact both the resilience and the "feel" of protected open spaces; warmer temperatures and changes in winter snow cover may also change when and how people recreate on conserved lands. Developing an invasive species or forest management plan and assessing the vulnerability of trails to flooding and the increased frequency and severity of storm events can help communities prepare for those changes. Beginning with Habitat has a Landowner Outreach Biologist ready to assist with local habitat management needs. For additional information specific to open spaces, visit the following websites and resources:

- The Nature Conservancy Resilient Land Mapping Tool
- Nature's Network
- Maine Land Trust Network (MLTN)

Example funding sources specifically for open space and/or wetland conservation are included in Section 7.

6.3 Energy Sources, Transmission, Distribution, and Communication

Power generators, fuels, lines, pipes, and towers – This is a provisional section.

Alignment with State and Maine Climate Council Strategies and Maine Community Actions (Community Resilience Partnership):

Strategy C: Reduce Carbon Emissions in Maine's Energy and Industrial Sectors through Clean-Energy Innovation:

- **Reduce Greenhouse Gas Emissions:**
  - C1 – Conduct a baseline for energy usage by municipal/Tribal government including electricity, heating and transportation fuels, and other energy sources.
  - C2 – Identify and track a simplified set of emissions indicators for community emissions reduction (e.g. number of EVs registered in the community, number of homes with solar panels, number of heat pump rebates from Efficiency Maine).
  - C3 – Adopt a resolution setting targets and a plan for reducing emissions and advancing clean energy from municipal/Tribal operations that align with the state's targets.
- **Advance Clean Energy Adoption:**
  - C4 – Adopt a renewable energy ordinance(s) that allows, enables, or encourages community-appropriate renewable energy and energy storage installations.
  - C5 – Adopt a streamlined permitting process for small-scale renewable energy installations.
- **Transition to Clean Energy:**
  - C6 – Enter into a long-term service contract or power purchase agreement (PPA) or adopt a clean power purchase policy to ensure increasing local government energy supplies come from renewable energy.

- C7 – Install a renewable energy project (solar, wind, geothermal, anaerobic digestion, etc.) on municipal/Tribal property (e.g. school rooftop, wellhead protection area, landfill, brownfield site, etc.).

Strategy D: Grow Maine's Clean Energy Economy and Protect Our Natural Resource Industries

Support Clean Energy Jobs and Businesses:

- D3 – Assess the suitability of privately-owned brownfield and disturbed/contaminated sites for clean energy projects and encourage project development.
- D4 – Establish incentives for clean energy industry or businesses to locate in community.
- D5 – Encourage and support clean energy industries in economic development plans.

We request content for this import section in future editions of the workbook.

6.4 Transportation

Alignment with State and Maine Climate Council Strategies and Maine Community Actions (Community Resilience Partnership)

Strategy A: Embrace the Future of Transportation:

- **Accelerate the Transition to Electric Vehicles (EVs)**
  - A1 – Purchase or lease electric vehicles for municipal or Tribal government-owned vehicle fleets. (Grants capped at $2,000 per light duty EV.)
  - A2 – Install EV chargers in public parking areas.
  - A3 – Adopt ordinances to encourage EV charging infrastructure, including at multifamily dwellings, businesses, and public parking areas.
  - A4 – Adopt an anti-idling ordinance.

- **Improve Mobility and Reduce Vehicle Miles Traveled (VMT)**
  - A5 – Implement strategies that increase public transit ridership and alternative transportation modes, including bike and walking infrastructure.
  - A6 – Implement strategies that encourage municipal/Tribal employees to commute via carpools, public transit, bike/walk, or other alternatives to single-occupancy vehicles.
  - A7 – Adopt a telework policy for municipal/Tribal government staff positions that can work remotely some days per week.
  - A8 – Adopt land use and development policies in plans and codes that reduce the need for driving (e.g., locating schools, workplaces, and shopping near where people live; encouraging density of development near housing and transportation).
  - A9 – Adopt a Complete Streets policy which addresses safety, bike/pedestrian uses, and transit.
  - A10 – Adopt a broadband plan that reduces the need to drive by increasing access to high-speed internet for underserved residents to support telecommuting, access to remote education, and telehealth.

Strategy G: Invest in Climate-Ready Infrastructure

- **Assess climate vulnerability of infrastructure:**
  - G1 – Conduct a vulnerability assessment for critical community infrastructure that includes: 1) the climate hazards to which infrastructure assets are exposed and how the intensity and likelihood will change over time; 2) the susceptibility to damage or failure given location, design, age, .condition, and state of repair; and 3) the consequences that impairment or failure of the infrastructure will have on the community.
  - G2 – Develop a Capital Investment Plan that a) identifies vulnerable municipal/Tribal facilities and assets, and b) prioritizes resilience in improvements and/or new construction.

- Utilize Climate-ready standards, designs, and practices to improve infrastructure:
- G3 – Improve and protect drinking water and wastewater treatment facilities to reduce physical damage and sustain function during extreme weather events

Roadways, culverts, and bridges are inherently exposed to damage from water. Hazards originate from either coastal flooding via sea level rise or storm surge, riverine flooding when extreme water levels driven by rain or snowmelt overtop natural or engineered features, or when road runoff is severe enough to cause damage on road shoulders or ditches. Designing transportation systems weighs a community's tolerance for risk and the costs associated with upgrading transportation systems to better endure flooding or runoff.

The first step for municipalities is to discern which areas or elements of the transportation system are at risk. If floodplain maps are available, a common surrogate to localize hydrologic modeling that incorporates climate science is simply to use the 0.2 %, 500-year storm within the FEMA floodplain rather than the 1%, 100-year storm scenario in design specifications. We believe this approach should be complemented with sea level rise maps and/or sea level rise and storm surge maps to ensure that vulnerable locations within a community's transportation system are not overlooked by the 0.2% storm floodplain maps alone. Public works department supervisors and field crew are likely to have important local knowledge of where and how flooding and water damage occur throughout the transportation system. Make use of this collective information to envision which features of a transportation system need modification for more intense precipitation and flooding occurrences.

Prioritize projects by urgency for public safety and travel and as opportunists, consider added resilience whenever culverts, bridges, or roads are scheduled for maintenance or replacement.

The costs associated with higher design standards are often minimal. Although few small municipalities' public works departments perform exacting cost-benefit analyses for routine maintenance and upgrades, we believe it is advisable to consider tracking the time and expenses associated with chronic small-scale damages to transportation systems. Such tracking acts as a way of monitoring climate change-related damages and supports community decision-makers in understanding the costs of inaction compared with the

investment of upgrading transportation system features to accommodate more extreme events.

- Municipal Climate Adaptation Guidance Series – Transportation Chapter (Maine.gov, Maine DACF)

Rethinking Tidal Road Crossings:

Traditional practices for designing tidal road crossings do not adequately address the unique complexities, uncertainties, risks, or benefits associated with tidal environments and climate change. In response, the Maine Coastal Program and an inaugural CoastWise Steering Committee convened experts in the field and marshaled the input of over 30 organizations to develop the CoastWise Approach for tidal crossing design. CoastWise provides a voluntary set of best practices, decision-making tools, and path for designing safe, cost-effective, ecologically supportive, and climate-resilient tidal crossings.

- Visit the CoastWise Website at Maine's Department of Marine Resources page (Maine.gov, DMR) to learn best practices for tidal crossings and get advice on individual projects.

90% of Maine's tidal road crossings are tidal restrictions and are thus more apt to experience flooding, higher maintenance costs, and to interrupt access to emergency services during major storm events. Furthermore, when tidal flows are not restricted by road crossings, tidal wetlands can provide a variety of services to society including coastal storm and flood damage protection, pollutant removal, fish and wildlife habitat, and opportunities for shellfish harvesting and recreation. Some habitats, like salt marshes and seagrass meadows, have an outsized ability to store atmospheric carbon that would otherwise contribute to sea level rise and other climate shifts. To deliver these services, tidal wetlands must remain healthy and resilient to sea level rise which requires tidal flow that is unimpaired by our transportation system.

We request content for the following case studies for the following edition:

- Prioritizing based on public safety
- Road elevation
- Road built to accommodate episodic saltwater flooding
- Culvert upgrade/change for fish passage and testimonial from Stream Smart Crossings
- Bridge example

6.5 Drinking Water

Alignment with State and Maine Climate Council Strategies and Maine Community Actions (Community Resilience Partnership)

Strategy G: Invest in Climate-Ready Infrastructure

- **Assess climate vulnerability of infrastructure:**
  - G1 – Conduct a vulnerability assessment for critical community infrastructure that includes: 1) the climate hazards to which infrastructure assets are exposed and how the intensity and likelihood will change over time; 2) the susceptibility to damage or failure given location, design, age, condition, and state of repair; and 3) the consequences that impairment or failure of the infrastructure will have on the community.
  - G2 – Develop a Capital Investment Plan that a) identifies vulnerable municipal/Tribal facilities and assets, and b) prioritizes resilience in improvements and/or new construction.
- **Utilize Climate-ready standards, designs, and practices to improve infrastructure:**
  - G3 – Improve and protect drinking water and wastewater treatment facilities to reduce physical damage and sustain function during extreme weather events.

"Regardless of whether drinking water comes from a public system or a private well, it is one of the most crucial elements making an area habitable. Maine is fortunate to have high quality and quantity of drinking water throughout most of the state. However, both public and private drinking water systems may be at risk from changing climate conditions. This is another issue for which engineering expertise as part of the vulnerability assessment may be a worthwhile investment. Drinking water supplies may be at risk from saltwater contamination due to sea level rise and/or storm surges regardless of the type of drinking water infrastructure. Increasing temperatures are likely to increase the demand for water and draw down for irrigation is likely to impact low-flow conditions differently. Maintaining adequate quantity and quality of drinking water requires long-term planning and budgeting".[27]

Key considerations for increasing resilience in drinking water infrastructure:

- Participating in community planning collaborations and emergency response exercises.
- Analyze a range of climate impacts over a specified period of time (scenario-based approach).
- Assess the location and condition of all parts of the drinking water system relative to sea level rise and flooding risks, and if on the coast consider retrofitting the system to detect and respond to saltwater intrusion if appropriate.
- Assess how forested or grassland habitats associated with drinking water aquifers may be affected by climate changes, e.g., case studies like the Wells Barrens Preserve.
- Determine if adaptation is needed in the face of climate impacts and if strategies exist and are cost-effective.
- Consider additional sources for source redundancy or develop interconnections if appropriate.
- Use planned maintenance and repair as opportunities to implement adaptation strategies.
- Investigate funding options for work beyond the scope of planned maintenance and repair.
- Update drought contingency plans, develop emergency response plans, and establish mutual aid agreements with neighboring utilities if appropriate.
- Establish alternative or on-site power supply.
- Monitor surface water conditions and consider retrofitting intake to accommodate lower flow or water levels.

For more information specific to drinking water, visit the following websites and resources:

- Municipal Climate Adaptation Series – Drinking Water (Maine.gov, Maine DCAF) (PDF)
- Significant Aquifers in Maine – Maine Department of Agriculture, Conservation and Forestry – Maps, Sand and Gravel Aquifers
- Water/Wastewater Agency Response Network (WARN)
- Resilience and Adaptation in New England (RAINE) database (EPA) – 207 wastewater and water utilities in New England addressing climate change in some way.
- US EPA guidance on assessing risk, emergency response, recovery, and training for drinking water and wastewater resilience:
    - Climate Impacts to Water Utilities (ARC-X)

- Adaptation Strategies Guide for Water Utilities
- Climate Change Adaptation Resource Center (ARC-X)
- Water Resilience

6.6 Wastewater Utilities

"Wastewater infrastructure is essential for protecting the public health from waterborne diseases and protecting the quality of our fresh and coastal waters. Evaluating the vulnerability of wastewater infrastructure should include not only evaluating the treatment plant but pumping stations and sewer lines as well. This is an area where engineering expertise is a worthwhile investment as part of the vulnerability assessment process. Treatment plants are frequently located at the 'low point' in town – it could be in a floodplain, it could be in an area at risk from sea level rise. Sewer lines may run along roadways and be at risk if culverts or bridges are damaged from increased amounts of precipitation which then creates risk of sewage spilling into rivers and streams. Understanding the level of vulnerability of all the components of the system and possible adaptation strategies is essential to being able to make an informed determination on whether cost-effective options exist to increase its resiliency.

Several Maine communities have gone through this analysis; see links on the following page for case studies.

Communities with septic systems should consider mapping the location of these systems in relation to floodplains and areas at risk from inundation from sea level rise. Increased freshwater flooding or impacts from sea level rise are both stressors that can impact if and how well a septic system continues to function. Malfunctioning septic systems can impact drinking water supplies, and natural resources, and pose a serious risk to human health."[28]

Key considerations for increasing resilience in wastewater infrastructure:

- Analyze a range of climate impacts over a specified period of time (scenario-based approach).
- Assess the location and condition of all parts of the wastewater system relative to sea level rise and flooding risks.
- Determine if adaptation is needed and if strategies exist and are cost-effective.
- Use planned maintenance and repair as opportunities to implement adaptation strategies.
- Investigate funding options for work beyond planned maintenance and repair.
- For septic systems: map the current location of septic systems.

- Analyze the location of septic systems relative to increased flood risks and sea level rise.
- Consider ordinance language to add performance standards for the installation of new systems in vulnerable locations and inspection and decommissioning of existing systems in vulnerable locations when certain conditions arise.
- Integrate climate change projects for your utility across multiple activities including a County Hazard Mitigation Plan, Emergency Operation Plan, Asset Management Plan, Capital Improvement Plan, as well as in a community-wide Climate Adaptation Plan or standalone plan Climate Plan for the utility.
- Explore multiple funding sources to assess, plan, design, and implement climate projects including:
    - FEMA Public Assistance (PA) Grant Program & Hazard Mitigation Grant Program (HMGP)
    - EPA Hazard Mitigation for Natural Disasters & Drinking Water and Clean Water State Revolving Loan Funds (DWSRF) (CWSRF) & Loan Principal Forgiveness
    - USDA Rural Development Emergency Community Water Assistance Grants
    - HUD CDBG and Section 108 Guaranteed Loans
    - SBA Disaster Loans

For more information specific to wastewater management, visit the following websites and resources:

- Municipal Climate Adaptation Guidance Series – Wastewater Infrastructure (Maine.gov, Maine DACF) (PDF)
- Maine Water/Wastewater Agency Response Network (WARN) (Maine.gov, DHHS)
- Resilience and Adaptation in New England (RAINE) database (EPA) – specific examples of wastewater and water utilities in New England addressing climate change
- US EPA guidance on assessing risk, emergency response, recovery, and training for drinking water and wastewater resilience
    - Adaptation Strategies Guide for Water Utilities
    - Climate Change Adaptation Resource Center (ARC-X)
    - Water Resilience

Learn from and connect with peers across many examples in Maine:

- Coastal Community Grants (CCG) Coastal Resiliency:

    - **Wiscasset:** Town of Wiscasset, Waste Water Treatment Plant Coastal Hazard Resilience (Maine.gov, Maine Coastal Program) (PDF)
    - **Boothbay Harbor:** Lincoln County Regional Planning Commission Downtown Boothbay Harbor Adaptation Options for Increased Storm Surge Resiliency (Maine.gov, Maine Coastal Program) (PDF)
    - **Stonington:** Town of Stonington Flood Vulnerability Assessment and Adaptation Plan for Municipally Owned Infrastructure (Maine.gov, Maine Coastal Program) (PDF)
    - **South Portland:** City of South Portland Vulnerability Assessment Mapping (Maine.gov, Maine Coastal Program) (PDF),
    - and **vulnerable WWTP** — Rising seas, bigger storms threaten sewer plants (Island Institute) —
      including **Portland**, **Saco** and
    - **Ogunquit:** Turning the Tide: Adaptation Options to Protect against for Sea Level Rise, Coastal Flooding, and Storm Surge in Ogunquit, Maine (Maine Water Utilities Association, MWUA) (PDF)
- Clean Water State Revolving Loan Fund (Maine.gov, Maine DEP)

6.7 Stormwater

As highlighted in the Scientific Assessment of Climate Change in Maine, precipitation in Maine "has become both heavier and more frequent," with most of the increase in precipitation coming from one-inch and two-inch storm events (though three-inch and four-inch storm events are also increasing in frequency.)

Addressing Increased Sediment Runoff and Non-Point Source Pollution:

The highest concentrations of pollutants and sediments occur in the initial surface runoff during a storm event. This is known as the "first flush" effect and it is the reason why current Maine stormwater management rules require capture and treatment of the first inch of stormwater runoff from impervious surfaces and 0.4 inches of runoff from landscaped surfaces for new development projects. An increase in the frequency of precipitation events due to climate change will increase the amount of sediment and pollutants running off a site. This will negatively impact water quality in the State's streams, rivers, ponds, and lakes. A reduction in water quality affects the entire ecosystem of organisms that rely on clean water, including us.

Federal authorities on water quality like the Environmental Protection Agency (EPA) and National Oceanic and Atmospheric Administration (NOAA) as well as regional

environmental protection organizations like the New England Interstate Water Pollution Control Commission (NEIWPCC) and the Southeast New England Program (SNEP) encourage the use of green infrastructure to filter and remove pollutants from stormwater runoff. Green infrastructure offers excellent pollutant removal through a variety of mechanisms including physical filtering, nutrient uptake by vegetation, and microorganism breakdown.

Green infrastructure practices also come with a variety of co-benefits:

- Improved air quality
- Increased water quality and reductions in stormwater runoff and pollutant loading
- Decreasing localized temperature and reduction of urban heat island effect
- Noise abatement
- Increase natural habitat and biodiversity
- Improved aesthetics leading to an increase in social and economic value
- Recreation opportunities
- Carbon dioxide removal

Additionally, the Bureau of Land Resources at the Maine Department of Environmental Protection is currently working to update the Construction General Permit to help address soil erosion and sediment control on construction sites. The Stormwater Engineering Team in the Bureau of Land Resources at the Maine Department of Environmental Protection is also in the process of updating the Chapter 500 stormwater rules. Two areas of focus with the Chapter 500 update include changing precipitation frequency and intensity due to climate change and low-impact development.

Addressing Legacy Infrastructure and Flooding:

An increase in the frequency and intensity of extreme precipitation events will also impact existing stormwater infrastructure. Some legacy infrastructure is not designed to handle the increasing volumes of stormwater runoff leading to failures, flooding, and erosion problems.

Entities like the Maine Turnpike Authority (MTA) and Maine Department of Transportation (MaineDOT) are incorporating increasing precipitation volumes into their stormwater infrastructure design and working to replace undersized culverts. The Maine Department of Environmental Protection also operates the Municipal Stream Crossing Upgrade Grant Program to help municipalities upgrade culverts at stream crossings to improve public safety, minimize flooding, and improve habitat for fish and wildlife.

In communities with combined sanitary and storm sewers, increasing rainfall intensities may increase combined sewer overflow (CSO) events where a mix of untreated wastewater and stormwater discharge into waterways to prevent overwhelming wastewater treatment facilities. Currently, communities with combined sewers are required to obtain discharge licenses with the Maine Department of Environmental Protection and efforts are underway to reduce and eliminate the occurrence of discharge events.

- Case Study: Assessing and Reducing Impervious Cover and Evaluating Green Infrastructure Feasibility in Urban Centers and Combined Sewer Communities in New Jersey. Additional information and examples can be found here: Water Resources Program: Projects & Programs – Keep the Rain from the Drain (Rutgers New Jersey Agricultural Experiment Station). New Jersey has large areas of intense urbanization and development. Studies suggest that watersheds with as little as 10% impervious coverage can see impairments to water quality. Since 2014, the Rutgers Cooperative Extension Water Resources Program has been assessing impervious coverage totals for dozens of municipalities using land use cover GIS layers using grant funding from the National Fish and Wildlife Foundation and others. Based on this data, they identified many municipalities greatly exceed 10% impervious coverage leading to major impairments to their watersheds. Using the impervious cover data, aerial image analysis, and site visits, the Water Resources Program creates reduction action plans that identify 10-20 opportunities in each municipality where impervious cover can be removed or disconnected and treated with stormwater management practices. The Water Resources Program also conducts Green Infrastructure Feasibility Studies where they identify 15 locations in a town that could benefit from green infrastructure practices to treat stormwater runoff. For several of these locations, a rendering of the proposed green infrastructure practice is provided to help facilitate implementation. Many of the projects in the impervious cover reduction action plans and green infrastructure feasibility studies end up getting built with the help of federal and private grants. These projects also fit with the other initiatives in the state to disconnect impervious surfaces and slow stormwater from entering combined sewer systems to reduce overflow events. While no programs currently exist in the State of Maine to identify retrofit opportunities to legacy development at a large scale like the Rutgers Water Resources Program, there may be an opportunity for communities to establish their own initiatives. The Southeast New England Program recently released the “New England Stormwater Retrofit Manual” to provide guidance around sizing, designing, and implementing stormwater infrastructure retrofits.

Key considerations for increasing resilience in stormwater infrastructure:

- Inventory existing stormwater infrastructure for location and condition and ensure proper inspection and maintenance protocols are established
- Size new development using projections of future storm events that account for precipitation changes due to climate change
- Identify opportunities to disconnect existing impervious surfaces
- Assess existing development for opportunities to retrofit legacy stormwater infrastructure or provide additional treatment/storage with green infrastructure practices
- Require low-impact development techniques for new development projects
- Investigate Green Infrastructure opportunities
- Require conservation subdivisions that protect and maintain open space and natural areas

Additional sample best practices for stormwater management:

- Sized to treat stormwater on-site, preferably for a 100-year storm event
- Must have formal equipment access
- Ease and minimal cost of cleaning
- Permanent maintenance easement
- Method and access for evaluation of maintenance
- Pretreatment devices are strongly recommended to prevent clogging or sedimentation problems
- Provisions for groundwater monitoring and assessment of quantities of water removed along with estimates in the design of expected sediment quantities
- A detailed and reasonable Operations and Maintenance plan exists

Regional Stormwater Management

Another approach to developing best management practices is forming a regional stormwater group to advance the implementation of common solutions and to share lessons among peers. To bring a formal structure to a group, a regional coordinating position could be funded specifically for stormwater management and could add capacity where limited resources may exist. While the examples below involve groups of Municipal Separate Stormwater Sewer System, or MS4, communities, a regional stormwater group could also be formed by towns that are not MS4s as they often also have common work areas as it pertains to stormwater management and community goals.

- **Interlocal Stormwater Working Group** (Cumberland County Soil & Water Conservation District) – A coalition of fourteen municipalities and two nested MS4 communities in the Greater Portland and Saco areas are working together to address stormwater pollutants. The Interlocal Stormwater Working Group (ISWG, pronounced "izzy-wig") consists of Biddeford, Cape Elizabeth, Cumberland, Falmouth, Freeport, Gorham, Old Orchard Beach, Portland, Saco, Scarborough, South Portland, Southern Maine Community College, University of Southern Maine, Westbrook, Windham, and Yarmouth. These communities work collaboratively to implement the Clean Water Act Municipal Separate Storm Sewer System (MS4) permit. The permit aims to reduce the impact of stormwater pollution on local waterways. In Maine, the Department of Environmental Protection (DEP) administers this permit on behalf of the US Environmental Protection Agency. The Cumberland County Soil & Water Conservation District coordinates ISWG and provides regional support and implementation of many of the permit's six required minimum control measures (MCMs). More information is available on the Interlocal Stormwater Working Group page (Cumberland County Soil & Water Conservation District).
- **Southern Maine Stormwater Working Group** – The Southern Maine Stormwater Working Group (SMSWG pronounced "sim-see-wig") is a collaboration of five Towns in York County working to protect stormwater from pollution that includes Berwick, South Berwick, Eliot, Kittery, and York. Each of these towns is regulated by a Clean Water Act Permit. The Permit requires that the towns conduct public education and outreach activities related to stormwater pollution prevention, inspect the storm drain system regularly for pollutants, and maintain the storm drain system and municipal properties. Clean Water is the primary goal of the SMSWG activities. More information is available on the Southern Maine Stormwater Working Group website.
- Bangor Area Stormwater Group – The Bangor Area Stormwater Group (BASWG pronounced "ba-see-wig") is a collaboration of Bangor, Brewer, Hampden, Milford, Old Town, Orono, Veazie, Dorothea Dix Psychiatric Center, Eastern Maine Community College, Maine Air National Guard, University of Maine Augusta – Bangor, and University of Maine. BASWG uses public education and sound science to improve regional water quality through collaborative stormwater management in the Greater Bangor Urbanized Areas. More information is available on the Bangor Area Stormwater Group (BASWG) website.

For more information specific to stormwater management, visit the following websites and resources:

- Municipal Climate Adaptation Guidance Series – Stormwater Management (Maine.gov, Maine DACF) (PDF)
- Maine Climate Council Reports (Maine.gov, Governor's Office of Policy Innovation & Future)
- Resilience and Adaptation in New England (RAINE) database (EPA)
- US EPA guidance on assessing risk, emergency response, recovery, and training for drinking water and wastewater resilience
    - Climate Change Adaptation Resource Center (ARC-X) – Strategies for Climate Change Adaptation – Actions for Water Quality (EPA)
    - Dover, New Hampshire: Building Climate Resiliency through Simpler, Lower-cost Green Infrastructure Designs (RAINE) (PDF)
- Adapting Stormwater Management for Coastal Floods (NOAA)
    - Determine how the flooding of today and tomorrow can affect their stormwater systems

Resources Relating to Green Infrastructure:

- Green Stormwater Infrastructure 101 for New England Communities (Southeast New England Program Network) (Recorded Webinar)
- Rain Garden Fact Sheet (Cumberland County Soil and Water Conservation District) (PDF)
- NOAA's Green Infrastructure Tools: Helping communities reduce extreme weather impacts using nature's processes.
- The Department of Environmental Protection developed fact sheets — Manuals and Guides to Reduce Water Pollution — to reduce water pollution. The materials describe practical green infrastructure designs.
    - Conservation Practices for Homeowners (Maine.gov, Maine DEP) includes fact sheets series targeted to lakefront property owners.
- Maine Stormwater Best Management Practices Manual (Maine.gov, Maine DEP): Technical manual that includes BMP specifications and chapter on LID.
- Cumberland County Soil and Water Conservation District on the Think Blue Maine website.
- Native Plants Fact Sheet: Native plants help beautify your property, create habitat, and protect our lakes, rivers, and streams (Cumberland County Soil and Water Conservation District) (PDF)

Retrofitting Legacy Stormwater Infrastructure:

- Stream Crossing Upgrade Grant, Bureau of Land Resources: Municipal Stream Crossing Upgrade Grant Program (Maine.gov, Maine DEP)
- New England Stormwater Retrofit Manual (Southeast New England Program Network)
- Potential funding opportunity to construct green infrastructure for municipalities, districts, and quasi-municipalities – (review the section on Green Project Reserve):
- Clean Water State Revolving Fund (CWSRF) (Maine.gov, Maine DEP)
- Potential green infrastructure funding opportunity for areas on the Nonpoint Source Water Pollution Control Grants ("319") (Maine.gov, Maine DEP)

Examples in Maine:

- City of South Portland: South Portland Stormwater Manual (Developed in 2009 by FB Environmental with funding from CBEP)
- City of Portland: FY12 Maine Coastal Program Competitive Coastal Grant, Clean Water, Clean Growth (PDF)
    - Stormwater Service Charge (City of Portland)
- City of Bangor: Stormwater Utility/Ordinance

Additional Department of Environmental Protection Resources:

- Land Resources, (Maine.gov, Maine DEP)
- Combined Sewer Overflow Program (Maine.gov, Maine DEP)

Join the Maine DEP Stormwater Engineering Team Listserv to find out more information about the Chapter 500 update and other stormwater-related topics:

- Subscriptions.Maine.gov, Maine Department of Environmental Protection, Email Updates (public.govdelivery)

6.8 Buildings

Alignment with State and Maine Climate Council Strategies and Maine Community Actions (Community Resilience Partnership):

Strategy B: Modernize Maine's Buildings: Energy-Efficient, Smart and Cost-Effective Homes and Businesses

- Transition to Heating and Cooling and Efficient Appliances in Municipal/Tribal Buildings:
    - B1 – Adopt and execute a plan for energy efficiency and building envelope weatherization improvements for municipal/Tribal buildings. Collaborate with the local school district for school building improvements.
    - B2 – Upgrade to energy-efficient interior lighting in municipal/Tribal buildings.
    - B3 – Upgrade to energy-efficient appliances in municipal/Tribal buildings.
    - B4 – Install a heat pump system or VRF system for heating/cooling and heat pump water heating in municipal/Tribal buildings.
    - B5 – Upgrade streetlights and exterior lighting for municipally/Tribally owned facilities with energy efficient LED lighting (and minimize light pollution with downlighting where possible).
    - B6 – Adjust procurement policies to prioritize climate-friendly Maine forest products (e.g., mass timber, wood-fiber insulation) in construction projects.
- Advance the Design and Construction of New Buildings
    - B7 – Adopt the energy efficiency stretch building code (currently IECC 2021).
    - B8 – Require EV charging readiness and solar energy readiness for all new construction.
    - B9 – Support regular professional development for code enforcement officers, especially Efficiency Maine's code trainings.
    - B10 – Adopt C-PACE ordinance for commercial property owners to install renewable energy systems, energy efficiency measures, and EV charging infrastructure (pending state program launch).

Maine's cities and towns play a vital role in reducing the carbon emissions from the building sector in their communities. Buildings account for nearly 40% of annual CO2 emissions worldwide. Eleven percent of emissions are from the construction industry while 28% of emissions are from operational energy use.[29] In the State of Maine, almost one-

third of the greenhouse gas emissions are from the heating, cooling, and lighting of our buildings.[30]

While the building sector can be divided into various components and looked at in different ways, for the purposes of municipal actions a community can implement, the three primary sectors are municipal, commercial, and residential buildings. Within all three sectors, there are existing buildings and new construction buildings to address.

6.8.1. Municipal

The easiest and most logical first step to address carbon emissions within buildings in a community is to implement changes within municipal buildings. Given the municipality has complete control over the operations and any renovations or new construction, making significant changes within these buildings is very achievable. There are budget implications that will require input from municipal government and may require residents' approval, but by implementing changes to municipal buildings, a community can demonstrate its commitment to carbon reductions making it politically easier to enact changes for the commercial and residential sectors.

Many progressive communities have started their journey towards a more sustainable future by passing a municipal "green building" ordinance or policy. While these ordinances/policies look different for each community, the goal is a commitment from the municipality to operate and build facilities to a certain standard. The New Buildings Institute has published a zero-emissions building policy for municipalities which is a road map for municipalities to make changes to their operations and achieve zero emissions in current and new buildings.

Here are their primary steps:

1. All municipally owned, occupied, or leased buildings take action to achieve net-zero emissions. This shall be achieved in new construction, major renovation and energy retrofit projects larger than 5,000 square feet by implementing the following strategies:
    1. Prioritizing energy efficiency by achieving appropriate Site Energy Use Intensity (EUI) targets developed by using energy modeling for new buildings/retrofits and benchmarking in existing buildings.
    2. Specifying electric sources for space conditioning, water heating, cooking, lighting, and all other non-emergency functions.
    3. Offsetting building operational energy use with renewable energy sources.

    4. Considering opportunities to reduce the lifecycle impacts of embodied carbon associated with materials.
2. All municipal departments shall develop a plan for the elimination of sources of fossil fuel combustion within their existing buildings by 2035.
3. Disclose the environmental impact of select building materials used in new construction and major renovation projects by submitting Environmental Product Declarations.
4. To further reduce GHG emissions from buildings, the following strategies are encouraged, but not required, as part of new construction and major renovation projects.
    1. Take steps to reduce the embodied carbon emissions associated with building materials.
    2. Account for GHG emissions from refrigerants and take steps to promote the use of low global warming potential (GWP) refrigerants.
    3. Account for GHG emissions from transportation sources and promote electrification of the county's [municipality's] vehicle fleet.

Other municipalities have instituted the preceding steps suggested by the New Buildings Institute and/or put in place policies mandating that all new buildings or major renovations be certified using a green building certification process. Several of the most common certifications include LEED, Green Globes, Living Building, and WELL Building Certification. Each certification has unique characteristics which might make it the best for an individual municipality.

6.8.2 Commercial

The next sector to address on the municipal level is the commercial building sector. Businesses are the lifeblood of the community and depend on the services provided by the municipality to thrive. By pushing them to operate carbon-free buildings, the municipality can increase its competitiveness while creating a progressive environment that will attract other businesses.

Energy Use in the Commercial Building Sector

There are three distinct categories of policies that have been adopted by different municipalities around the country to address energy use in commercial buildings: 1) benchmarking and transparency policies; 2) audit, tune-up, and re-commissioning policies; and 3) building performance standard policies.

Benchmarking and Transparency Policies

The least demanding to owners is a benchmarking and transparency policy. As of October 2021, nearly 50 states and municipalities have adopted benchmarking/transparency policies including Portland and South Portland.[31] These policies require most commercial buildings over a certain size to track and report their energy usage on a regular basis. This information is then in the public realm and can be disclosed. These policies usually do not include a next step for either the commercial building or for the municipality. The goal of benchmarking and tracking policies is to demonstrate the amount and costs of the energy used within a building's operations to motivate owners to reduce usage. Lack of compliance results in penalties to the owner.

Audit, Tune-up and Re-commissioning Policies

A more progressive approach to building energy use is a policy that requires owners to audit and then make changes to their properties. Similar policies have been passed in 15 different jurisdictions within the US as of October 2021.[32] Beyond simply reporting on usage, owners are required to then conduct an audit of the building to identify operational or capital problems resulting in unnecessary energy use. Various municipalities treat the final step differently as some do not require those changes to be made while other jurisdictions require owners to implement the suggested changes to their buildings' operations. Currently adopted policies vary in length of time between audits from 5 to 10 years.

Building Performance Standard Policies

The most stringent of the policies currently adopted in the US are termed building performance standard policies. As of October 2021, eight jurisdictions have adopted similar policies.[33] These policies generally require buildings to adopt a baseline for performance or set that baseline as of a certain date and then track and lower their usage over time with specific targets set by the municipalities. By requiring buildings to meet certain performance standards, municipalities can make significant reductions in carbon emissions. Penalties are levied for lack of compliance.

Non-Energy Specific Green Building Ordinances

Various municipalities around the US have adopted policies that go beyond simply looking at the energy use within buildings. These policies have primarily been focused on using specific certification standards as a requirement for major renovations and new

construction of commercial buildings. Although several programs are available, the most common certification program for US buildings is the United States Green Building Council's LEED certification. The process is a third-party certification that can be adapted for almost all building types. The process includes several requirements and optional elements for the building to pursue. For LEED, certification levels from "Certified" up to "Platinum" are available for projects and municipal policies vary on their requirements for levels of certification. This approach of using a third-party certification which requires a holistic approach to a building has proven to be a relatively easy way for a municipality to raise the standards for commercial buildings without encumbering staff with added responsibilities of monitoring and certifying projects.

While some jurisdictions have required certifications, others have provided incentives for buildings to achieve certifications. Expedited permitting time, reduced fees, and other measures can often be enough for owners to adopt certification standards.

6.8.3 Residential Codes and Stretch Codes

Residential buildings may be the most difficult sector to regulate. While requirements like the suggestions for commercial buildings are an option, requiring owners to make additional investments in their homes can be politically tricky. Building codes are the easiest way to push residential buildings to adhere to higher standards. The State of Maine has just passed new building codes including a building energy code. These required measures will help to push buildings throughout the state to be built to a higher standard for energy efficiency and local jurisdictions play a major role in enforcing the new state codes. Various tools are available from the State to help in the enforcement process and municipalities should make a strong commitment to enforcing the new codes. The State has also made it possible for local jurisdictions to adopt a "stretch code" for its energy efficiency code. As the name implies, the code goes beyond the statewide code and calls for added efficiency within new buildings. The stretch code adopted by the State is equivalent to the 2021 International Energy Conservation Code. Progressive municipalities can adopt the stretch code and require new buildings to adhere to these strict requirements for energy efficiency.

6.8.4 Historic Properties and Climate Change

The future of historic properties is often overlooked in the complex process of planning for the effects of climate change, yet historic properties will also be physically affected by wind, water, heat, and fire. Historic homes, businesses and industries, and civic and religious structures help create a unique sense of place, and in many cases comprise the

"infrastructure" that draws tourism and investment. Community members, municipal officials, planners, preservationists, and scientists can contribute to deciding how – and which – historic properties can be protected and can work to create incentives for properties to become resilient while preserving their historic significance. Due to their materials, designs or siting, some historic properties may require specialized approaches to protect them from water, wind, waves, heat, fire, or erosion.

Historic properties may differ from non-historic properties in many ways, e.g., structurally, or architecturally, they may include unique or fragile materials – sometimes irreplaceable, or feature craftsmanship and design characteristics of a specific era or tradition. Historic properties also derive their significance from their context – often including the location or setting. Every historic property is important for a particular reason, and there are character-defining features inherent in the property that convey its significance, without which the property's historic value may be diminished or lost. Understanding these features is key to helping historic properties adapt to the changing climate. The scale of the character-defining features can range from the tooled foundation treatment on a home to the layout and siting of a planned residential community. Some historic properties are iconic in their settings – lighthouses on the edge of the coast – and others may represent the identity of a community – a mill integrated into the town seal, for instance. Any adaptations or efforts to improve resilience should uniquely consider the features, contexts, materials, and associations of historic significance.

It is important to provide property owners with the resources to identify these features, contexts, materials, and associations for their property so that they can take them into consideration when planning to increase resilience or undertake adaptations.

Certain types of funding and/or permitting require the historic significance of a property to be considered before undertaking a project. Section 106 of the National Historic Preservation Act of 1966 (US General Services Administration, NHPA) requires federal agencies to consider the effects on historic properties of projects they carry out, assist, fund, permit, license, or approve throughout the country. If a federal or federally assisted project has the potential to affect historic properties, a Section 106 review is required. This review gives interested parties and the public the chance to weigh in on these matters before a final decision is made. This process is an important tool for citizens to lend their voice in protecting and maintaining historic properties in their communities.

As with municipal or regional adaptation efforts generally, adapting historic properties to climate change is a circular process: incorporating study, analysis, planning,

implementation, and monitoring before repeating this cycle as needed. Below are a series of action points that characterize this process.

1. **Identify properties.** Use existing community knowledge and consult with the Maine Historic Preservation Office to identify historic properties in your community. If the historic properties are well documented, this will inform mitigation and adaptation options; if not, create an easy-to-use inventory form to record the character-defining features of a property (this can be combined with number 4 below).
2. **Community dialogue.** Convene stakeholders at all levels to consider the economic, social, cultural, and historic value of the communities' historic properties. Consider the variety of functions they perform (i.e., is the old school now a community clinic?) and the variety of users associated with the resource. If a historic downtown, fort, or concert hall draws visitors and tourists from away, what is its value to the local economy? Develop initial short-term and long-term priorities. Discuss the economics, risk, and insurance to help communities understand the importance of spending money on planning to preserve and protect their historic properties.
3. **Identify Risk.** Identify threats at a community-wide level (including wildfire, floods, storms, heat, water, drought, and how economic decline or migration threaten historic properties) and provide property owners with easy-to-access information on specific threats (i.e., floodplain maps, sea level rise layers, wildfire vulnerability maps, etc.).• Weathering Maine (ArcGIS). Location of National Register-listed properties, cultural resources, and National Historic Landmarks vis a vis inundation scenarios.
4. Undertake a vulnerability assessment on the historic resources to identify specific points of weaknesses or strengths. In some cases, historic properties may already have an existing capacity for resilience (think large porches or awnings to protect from heat). This can be done at a local or regional scale or target a specific resource. New technologies, such as LIDAR and 3D scans can assist with surveys. Examples of vulnerability assessment forms include:• Survey 123 (ArcGIS): Portland South Portland Vulnerability Assessment for Maine
   • Maryland Historical Trust Architectural Survey Form for Hazard Mitigation Planning
5. Engage in further dialogue with the community and stakeholders to identify risk tolerance, refine economic assessments, present visual simulations of how the threats affect historic properties, and discuss roles, responsibilities, and funding.

6. **Make a Plan.** Make a hazard mitigation plan, disaster plan, or comprehensive plan, that recognizes and includes historic resources. Example guidance for threats, options for mitigation, and considerations of historic properties include:
    1. Staying Above Water Property Owner's Guide (Greater Portland Landmarks) (PDF)
    2. Guidelines of Flood Adaptation for Rehabilitating Historic Buildings (National Park Service)
    3. Boston Resilient, Historic Buildings Design Guide (City of Boston) (PDF)

The following are examples of short-term actions a community can take to implement projects specific to historic preservation:

- Create an action plan/ implementation team for community resources. Pre-plan for specific sites under a multitude of scenarios with Emergency Management officials and local organizations. Know who is going to do what in advance of a foreseeable threat.
- Purchase and install or store resiliency measures or devices (barriers, pumps, cooling units) appropriate for the characteristics of historic resources used by the community or public. Bulk purchase of protective equipment at a discount, or a tax incentive for adaptation activities can act as incentives for property owners to prepare for climate change.
- Publish town-wide, neighborhood, or threat-specific guidance on options for adaptation and resilience. Publish the action plan, links to product information, and the results of surveys and assessments in multiple formats and targeted both to specific organizations and the entire community. Make this information readily and easily accessible.

The following are examples of long-term actions a community can take to implement projects specific to historic preservation:

- Short-term plans and practices are important and can provide an incremental approach to dealing with climate change, but a longer-term vision is needed. Today's flood barrier may be tomorrow's underwater navigational hazard.
- Revisit, revise, and update the action plan on a regular schedule.
- Consider alternatives to physical preservation (3-D mapping, photographic documentation) as warranted.
- Acknowledge that the community's response to the challenge of climate change becomes part of its history and identity.

6.9 Public Health and Services

Alignment with State and Maine Climate Council Strategies and Maine Community Actions (Community Resilience Partnership):

- **Strategy F: Build Healthy and Resilient Communities**
  - F13 – Identify and plan to reduce public health threats in the community that are exacerbated by climate change.
  - F14 – Develop and implement an extreme temperatures emergency plan, including strategies that increase use of cooling centers by residents.
  - F15 – Establish a peer-to-peer program for checking in on vulnerable community members during extreme heat or cold events.
  - F16 – Increase community-level resilience to mosquito-borne diseases by implementing vector controls to decrease mosquito habitat.

Example Resources:

- Ozone Air Quality: Forecast Maine Department of Environmental Protection Current and Expected Air Quality Concentrations for upcoming 24 hours
- Atmospheric Deposition of Acid Rain: Maine Department of Environmental Protection Field Measurements
- Data on Heat Illness and Lyme disease in Maine: Maine Department of Health and Human Services, Center for Disease Control & Maine Tracking Network Health and environmental data, by geographic region, across age groups, genders, regions, and time periods, customized tables, charts, and maps
- Extreme heat: Maine Department of Health and Human Services, Center for Disease Control. Tips and strategies for dealing with extreme heat and hot weather, symptoms of heat-related illness.
- Heat: National Oceanic and Atmospheric Administration, National Weather Service Heat Safety, Heat Watch vs. Warning, Heat Index, During a Heat Wave, Common Heat-Related Illnesses.
- Lyme Disease: Maine Department of Health and Human Services, Center for Disease Control

- History; resource for residents, educators, physicians; data; reports and publication; legislation

6.10 Urban Forests and Forestry

Alignment with State and Maine Climate Council Strategies and Community Actions (Community Resilience Partnership):

- **Strategy D: Grow Maine's Clean Energy Economy and Protect Our Natural Resource Industries**
    - D2 – Adjust procurement policies to prioritize climate-friendly Maine forest products (e.g., mass timber, wood-fiber insulation) in construction projects.
    - Strategy E: Protect Maine's Environment and Working Lands and Waters, Promote Natural Climate Solutions and Increase Carbon Sequestration
    - E1- Set targets for increasing green space and tree planting to increase shade and water access in public spaces and carbon sequestration.
    - E2 – Incorporate a goal into conservation plans of conserving 30% of land in the community by 2030 (including undeveloped town property), with a priority on addressing conservation gaps related to high biodiversity areas, undeveloped blocks, and land and water connectivity.

All urban forests offer common environmental, economic, and social benefits to communities. Community trees and forests, when used as green infrastructure, reduce air and water pollution, and can reduce stormwater challenges. Shade from trees cools pavement and buildings reducing the "heat island" effect of developed areas, and thus lowering air conditioning costs and improving public safety during heat waves. Urban forests, trees, and green spaces attract people to the outdoors, foster active living, improve physical and mental health, and are associated with reduced crime rates and increased neighborhood pride and social connections. Street trees increase real estate value, can hold spiritual value, contribute to a sense of place for residents, and overall create more desirable places to live, work, and play. The extent that urban trees and forests provide these services depends on composition and design, varying considerably among factors

including the quantity, species, collective health and age of trees/forests, location, and adjacently the associated effort and costs for installation and maintenance.

Urban trees and forests are thus an element of how communities adapt to the hazards of climate change. However, the trees themselves may also be vulnerable to climate change. Rising temperatures, more frequent and severe storms, and variability in seasonal rainfall and drought patterns create physiological stresses on urban forests. When climate change stresses urban trees and forests, the ecosystem benefits to community wellbeing are compromised.

Climate change will continue to alter species ranges and regeneration rates, further affecting the health and composition of urban forests. Warmer winter temperatures increase the likelihood of winter tree kill. Therefore, proactive management is necessary to protect urban forests against climate-related threats and sustain desired urban forest structures for future generations.

Local climate action plans should incorporate urban forestry into mitigation and adaptation strategies.

Mitigation:

The sustainable use of wood, food, and other goods provided by urban forests can displace imports associated with a higher carbon footprint. Urban wood is a valuable and underused resource.

Strategically planting trees around buildings promotes energy efficiency, and enlarging and improving planting sites improves tree longevity and increases stormwater infiltration; including trees in street improvement projects.

Urban forests also help mitigate climate change by capturing and storing carbon dioxide CO2. Large-stature species with dense wood store the most carbon, and trees of certain species may exhibit more desirable lifetime carbon capture-to-emissions ratios. Maintaining tree canopy in perpetuity also sustains carbon storage within urban trees and forests and allows carbon to accumulate in soils.

Adaptation:

Planting a diverse mix of pest-tolerant, drought-resistant, low-maintenance, and long-lived trees ensures greater resilience of urban forests to climate change. Planting small groves of water-tolerant species in areas receiving peak volumes of stormwater runoff reduces

flooding and removes pollutants. Establishing and adhering to a regular maintenance cycle can help protect communities from the hazard of blow down in storms. Hazardous or diseased trees must be removed or treated, and young trees must be pruned early and often to encourage the development of strong branching structures that are less vulnerable to storm and wind damage.

Local governance:

Due to limited staff and budget resources, many communities rely on partnerships with private landowners, organized citizen groups, and nonprofit agencies to effectively manage urban ecosystems. Communities should assess staffing capacity dedicated to the management of the urban and community forest along with local professionals available for tree and forest planning and management.

Volunteer and citizen-based initiatives may complement or augment municipally run adaptation and mitigation strategies. Community volunteers can gather the data needed to develop informed urban forest management and climate action plans. Neighborhood workdays provide opportunities for residents to join forces to restore, maintain, and/or expand the urban forest. Such citizen involvement improves urban forest health while strengthening community social ties, creating an environment conducive to cooperative adaptation to climate change.

Specific strategies:

- Know what you have through inventory/mapping of the resource. This forms the basis for planning and management.
- Assess staff capacity, local resource professionals, and local organizations or affiliations dedicated to urban and community forest health and open space stewardship.
- Use this information to develop realistic budgeting.
- Follow through on the plan by maintaining a healthy and diverse forest. Climate change poses the greatest risk in forests that lack diversity and structure. Plant a diversity of non-invasive and preferably native species hardy to Maine's weather (drought, intermittent flooding, heavy snow, ice, wind). Planting open spaces with variety in size, age, and structure will increase forest resilience to the many extremes of climate change.

For more information specific to forestry, visit the following websites and resources:

- Invasive Threats to Maine's Forests and Trees (Maine Department of Agriculture, Conservation and Forestry)
- Forest Inventory Program, Maine Forest Service General Publications: Maine Department of Agriculture, Conservation and Forestry Survey Reporting on Numbers and Trends
- Climate Adaptation Fellowship: Developed in partnership with the University of Maine, Forest Stewards Guild, Manomet, USDA Northeast Climate Hub, and others Peer-to-Peer Learning Program; Farms, Forests, and Communities; Modules Tailored for Northeastern Land Managers and Advisors
- Project Canopy (Maine Department of Agriculture, Conservation and Forestry)
- Forest Adaptation (Climate Change Response Framework)
- Northeast Climate Hub (US Department of Agriculture)
- Climate Change Tree Atlas (US Department of Agriculture Forest Service)
- Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers, 2nd Edition (US Department of Agriculture Forest Service)
- USFS Climate Change Resource Center
- Vibrant Cities Lab website
- Climate Adaptation actions for urban forests and human health (US Department of Agriculture Forest Service)
- I-Tree Eco website: Tool for conducting urban forest inventories
- American Forests Tree Equity Score website: Helps identify neighborhoods in greatest need of urban tree planting
- Arbor Day grants for green spaces in low tree equity locations: TD Green Space Grant Information (Arbor Day Foundation)
- Tree City USA Bulletin and Resources (Arbor Day Foundation): Helpful resources for urban and community forestry, especially for new and intermediate practitioners

6.11 Marine Resources, Fisheries, and Water Quality

Alignment with State and Maine Climate Council Strategies and Maine Community Actions (Community Resilience Partnership):

Strategy D: Grow Maine's Clean Energy Economy and Protect Our Natural Resource Industries

• Support Maine's Natural Resource Economy:

- D1 – Adopt policies that enable, support, or incentivize local food production and consumption, including community gardens.

Strategy E: Protect Maine's Environment and Working Lands and Waters, Promote Natural Climate Solutions, and Increase Carbon Sequestration

- Protect Natural and Working Lands and Waters
  - E2 – Incorporate a goal into conservation plans of conserving 30% of land in the community by 2030 (including undeveloped town property), with a priority on addressing conservation gaps related to high biodiversity areas, undeveloped blocks, and land and water connectivity.
  - E3 – Create or update a watershed plan to identify flooding and water quality priorities and adaptation options.
  - E4 – Develop a natural resource and habitat inventory that includes climate stressors and impacts.
  - E5 – Conserve, revegetate and reconnect floodplains and buffers in riparian areas.
  - E6 – Preserve climate-threatened natural areas such as wetlands, riparian areas, and headwater streams through zoning or other regulations.
  - E8 – Adopt policies that prioritize natural, nature-based or ecologically enhanced shoreline protection for coastlines, rivers, and lakes.
  - E9 – Identify and protect sites for living shorelines and saltmarsh migration areas.

Maine's economic and cultural well-being has an outsized dependence on marine resources and the security of coastal communities. Many coastal communities in Maine are home to diverse fisheries, aquaculture, and other marine sectors. Climate change is affecting the habitat underlying sustainable marine resources and the distribution of those species in Maine's waters. Much of the working waterfront infrastructure that supports these sectors and provides coastal access is owned and/or maintained by municipalities. While there are various factors affecting access to these fisheries and sea farms, sea level rise, storm surge, and flooding have unique risks that municipalities should consider when planning for climate adaptation and resilient fisheries. In addition to habitat protection,

proper planning will allow for continued reliance on the 'blue economy' for jobs, tourism, and the availability of local seafood and sea vegetables.

The first step to building more resilient fisheries and shoreside infrastructure is to take an inventory of existing marine resource-based jobs and businesses and local ecosystem services pertinent to marine industries. This can include the number of municipal shellfish licenses, the number of state and federal fishing licenses held by residents, DMR data on all species of fishery landings (volume and value), the number and acreage of aquaculture leases, and the factors within the purview of town decision-making that relate to habitat and ecosystem health for local fisheries (further detailed below). A similar inventory should be conducted for working waterfront infrastructure, including wharves, docks, slips, broadside berthing, boat ramps, moorings, hoists, parking, unloading, bait or gear storage, access to ice, etc. Also, access points to intertidal areas are important to inventory and map to understand any loss in access, as well as to help identify future access points. An example template for this kind of inventory was developed through efforts by the Maine Coast Fishermen's Association and partners (Working Waterfront Inventory Report and Template). The Comprehensive Planning and Land Use Regulation Act, MRSA Title 30-A, §4312.3.G; §4326.1.D; §4326.3-A.E., 2001 (Maine Legislature website) requires that each comprehensive plan (for a coastal community) include an inventory and analysis of marine-related resources and facilities such as ports, harbors, commercial moorings, commercial docking facilities and related parking, and shellfishing and worming areas.

Once these inventories are created, municipalities can use existing data and resources (Table 2) to assess risk. There may be challenges regarding access to data, as fisheries landings and population data typically lag months to a year (or more) behind, depending on the frequency of stock surveys and population abundance estimates and reconciliation of landings data.

There are other important coastal considerations for municipalities regarding ecosystem health and integrity, such as conserving or restoring habitat (Section 6.2), maintaining good water quality for commercial fish species and for coastal environmental health more broadly, and consideration of the cultural, environmental, and economic distinctions among near-shore environments including beaches, marshes, coastal bluffs, intertidal mudflats, and intertidal rocky zones. Risk to environments and ecosystems can be informed with a number of GIS-based mapping tools, for example, Maine Inland Fisheries and Wildlife's Beginning with Habitat and Department of Marine Resources' Shellfish Closures and Monitoring Data Map Viewer, or the National Oceanic and Atmospheric Administration (NOAA) Fisheries' Climate Vulnerability Assessments. NOAA Fisheries

assesses the vulnerability of fish stocks, protected species (marine mammals, sea turtles), habitats, and fishing communities to changing climate and ocean conditions, to better inform the many diverse people and businesses that depend on them.

Given the direct implications of water quality for the health of marine resources, it is imperative that municipalities evaluate existing monitoring data when making any decisions that may affect water quality in estuaries and the intertidal zone. The State and a number of academic and nonprofit organizations regularly test and monitor various water quality parameters in nearshore waters. Results from this monitoring are typically available online from the state and local organizations that collect the data.[34]

In addition, for municipalities with shellfish programs, the DMR conducts shoreline surveys every 12 years to locate potential point and non-point pollution sources. Once identified in the survey, towns can work with homeowners on failing septic systems, farmers on waste management, or sewer and stormwater professionals, for example. Municipalities can also limit the likelihood of harmful algal blooms by assessing and regulating fertilizer and pesticide use through an ordinance and/or outreach and education. For example, the Cumberland County Soil and Water Conservation District has a YardScape Program that towns can utilize to educate their residents. Municipalities can address risk and potential mitigation or adaptation measures in coastal comprehensive plans. Municipal committees, along with the harbormaster and local land trusts or nonprofit organizations can collaborate to implement these measures where needed. They may also work with landowners and farmers to address any potential non-point-source pollution concerns and mitigation. With proper community outreach and engagement, adaptation, and mitigation projects should be reviewed and prioritized, approved by the town council or board of selectmen (where necessary), and funded through public or private funds.

Projects should be monitored and evaluated using relevant outcomes, metrics, and indicators (see Section 4). Finally, the marine resources and infrastructure in inventory that are not prioritized for action should continue to be monitored for changes.

6.12 Agriculture

Alignment with State and Maine Climate Council Strategies and Community Actions (Community Resilience Partnership):

- Strategy D: Grow Maine's Clean Energy Economy and Protect Our Natural Resource Industries

    - D1 – Adopt policies that enable, support, or incentivize local food production and consumption, including community gardens.
    - D2 – Adjust procurement policies to prioritize climate-friendly Maine forest products (e.g., mass timber, wood-fiber insulation) in construction projects.

- Strategy E: Protect Maine's Environment and Working Lands and Waters, Promote Natural Climate Solutions and Increase Carbon Sequestration

Maine agriculture is diverse and generates over $660 million of direct value in the Maine economy. Farms rely on a variety of local business services to support their operations, thereby contributing to the local economy. From potato and broccoli operations in St. Agatha to small urban farms in downtown Lewiston, the nature of agriculture in Maine varies in size, scope, and strategy. Beyond the direct economic impact of crop sales, farms, and farmers are responsible for stewarding many shared public resources: including scenic landscapes, ground and surface water reservoirs, and wildlife habitat. These resources all contribute either directly or indirectly to healthy communities and ecosystems. To best protect the integrity of these resources and the food system more generally, farmers need to be welcomed participants in municipal planning processes.

90 percent of Maine food is imported from out-of-state sources. Transportation of food over long distances contributes to climate-warming greenhouse gas emissions. Disruptions in supply chains have demonstrated the importance of local sources to support community food security. Maine has enough land to produce large volumes of food for itself and neighboring states. Local plans and ordinances should support expanding agricultural capacity.

Farming is largely weather-dependent, and climate change is impacting agriculture in various ways. Warming temperatures may increase the length of growing seasons and expand the variety of crops that can be grown in Maine. However, agriculture can also be adversely affected by both too much and too little rainfall at various points in the growing season. Shifts in Maine's climatic conditions have already put pressure on Maine farms and food producers: historic levels of drought, new pest populations that have migrated northward or survived mild winters, and unpredictable frost dates at the beginning and end of the seasons have all led to challenging growing seasons in recent years.

Development pressures are often a threat to farms. Local comprehensive plans and land use ordinances that recognize the importance of protecting agricultural lands can reduce

sprawl, municipal infrastructure costs, and loss of open space. Soils designated as "Prime Farmland" or "Farmland of Statewide Importance" are unique resources that can support a wide range of agricultural activities – they typically have ideal drainage and water retention capacity, adequate depth to bedrock, ideal conditions for plant nutrition, and minimal slopes or stones. Protecting these soils is a high priority in safeguarding the future of our food system. Even if they do not fall within the property boundary of a farm, natural resources like surface and groundwater sources or resilient and diverse ecosystems are major factors in the viability of local agriculture and should be considered as indirect, but important, facets of a strong food system.

Many farms in Maine have adopted practices to either reduce the carbon output of their operation or to mitigate risk to their operation with a changing climate. This could look like reducing tillage to build biologically active soil with greater water-carrying capacity, building greenhouses or high tunnels to protect crops from extreme weather events, or letting some fields return to meadows or forests to build wildlife habitats and sequester carbon. Municipal officials are encouraged to recognize that farming looks different in different places and that the very nature of agriculture in Maine is changing as quickly as our climate.

For more information specific to agriculture, visit the following websites and resources:

- Maine Farmland Trusts' Guide to Municipal Planning for Agriculture (to be updated Summer 2022)
- USDA Natural Resources Conservation Services' Web Soil Survey – maps of prime farmland and statewide-significant soils
- Conservation Assessment and Planning Tools (USDA, National Resources Conservation Service)
- Soil & Water Conservation Districts (Maine.gov, Maine DACF)
- Maine DACF's Farmland Protection Resources
- Municipal Planning Assistance Program – Technical Assistance (Maine.gov, Maine DACF)
- Land For Maine's Future LMF Working Farmland Access Protection Program (Maine.gov, Maine DACF).

6.13 Education and Community Science Programs

Throughout Maine, the Department of Education, nonprofit organizations, professional associations, and universities are working towards educating all generations about the impacts of climate change and how to mitigate and adapt. Public participation in science

activities can build local environmental literacy, the data from community science investigations can help communities prepare for and respond to climate impacts, and the participatory process can galvanize public interest and attitudes in your community's choices for adaptation.

Community science programs can involve members of the public through photography, collecting samples, and mapping or counting a variety of indicators. Community science can empower community members, can leverage the cost savings of volunteerism, and can broaden municipal governments' capacity for many efforts by way of recruiting new participants to join workgroups and committees that interface with town leadership. School and University students and teachers, existing town committees, and members of the public with community organizing or science backgrounds are typically principal contributors. The most impactful community science programs are those that have a clear, decision-oriented objective, ensuring that the data collected, and the new knowledge gained from community science goes beyond providing only more information and leads to specific improvements in a community process or action. [35]

6.13.1 Maine Department of Education

Interdisciplinary climate education is a central focus within the Office of Innovation at the Maine Department of Education (MDOE). The new Maine Science & Engineering standards (NGSS) were adopted in April 2019 and incorporate climate change. MDOE developed a PK-12 MOOSE Climate Education Learning Progression. All modules are inquiry-based and encourage students to apply critical thinking skills and develop their own ideas and answers to essential questions. MDOE is also developing a statewide environmental literacy plan which incorporates climate change education.

6.13.2 Professional Development for Climate Educators and Students

There are many regional, statewide, and national resources available for professional development for educators as well as for students to become involved in climate education. A few of these programs are described in this section.

Maine Environmental Education Association (MEEA)

"MEEA organized the first statewide Climate Education Summit in 2021. On the leading edge of aligning state climate education with upcoming national guidelines, MEEA, our Changemakers Network, JustME for JustUS, the Nature Based Education Consortium, and Maine Climate Action Now, identified the need for a convening event where organizations

working on intersectional climate and climate justice education can learn about the work of one another, build a shared vision about climate education and literacy in Maine, and start to identify strategies that will support the advancement of critical climate and climate justice education statewide." More information is available on the Maine Environmental Education Association website.

The Climate Initiative

The Climate Initiative (TCI) is a nonpartisan, science-based climate change organization whose mission is to empower youth voices for climate action. Through education and empowerment initiatives, youth are learning about climate solutions and becoming agents of change in our communities and beyond. They offer many programs to engage youth in local communities and empower them to become agents of change. The Learning Lab provides interactive tools and curriculum for students and teachers. Their ambassador program trains youth and adults to turn their climate passion into action. TCI offers a Community Mapping Workshop to discover the places your community values and to start important conversations on how climate change will affect them. They coordinate town hall meetings to provide a platform for youth to engage with politicians, business leaders, and decision-makers in their communities. TCI also offers a Gulf of Maine Field Studies class, which focuses on addressing local issues. More information is available on The Climate Initiative website.

6.13.3 University of Maine Climate Change Institute – Climate Education Resources

The University of Maine's Climate Change Institute (CCI) has, "assembled a collection of materials produced by CCI researchers and students that can be used in the classroom – informational websites, data tools, videos, learning activities, and other resources – to support teaching about climate change and its connections to people."

The Climate Education Resources webpage has content organized by themes, and each item has a list of related Next Generation Science Standards (NGSS) and suggested student grade levels. More information is available on the Climate Education Resources page (UMaine's Climate Change Institute).

6.13.4 Gulf of Maine Research Institute – LabVenture:

Each year, GMRI hosts nearly 10,000 Maine middle schoolers in its LabVenture program — a hands-on, interactive, authentic investigation of the changing Gulf of Maine ecosystem.

Completely free for Maine schools, nearly 70% of the state of Maine's fifth and sixth-grade cohort experience LabVenture annually. At the lab, students use authentic tools of science and methods of inquiry to explore many of the same questions about the Gulf of Maine that research scientists at GMRI are addressing. More information is available on the Gulf of Maine Research Institute's LabVentures page.

6.13.5 Community Science Initiatives

There are numerous community science initiatives throughout the State. Just a few of these programs are detailed in this section.

- University of Maine Cooperative Extension and Maine Sea Grant coordinate the Signs of the Seasons program in partnership with the USA National Phenology Network (USA- NPN), Acadia National Park, Schoodic Education and Research Center, U.S. Fish and Wildlife Service, Maine Maritime Academy, Maine Audubon, Coastal Maine Botanical Gardens, and climate scientists and educators at the University of Maine. Using backyards as laboratories, participants' phenology observations of plants and wildlife provide data on the local effects of global climate change.
- Southern Maine Conservation Collaborative (Community Science) Network. The Climate Change Observatory Network (CCON) is a photo monitoring with environmental organizations and communities to assist with the observation, measurement, and documentation of long-term climate change trends. Using participatory tools and collaborative partnerships, the program brings people with various perspectives and knowledge together to co-learn about climate change and adaptation. The CCON encourages participation in climate change study, develops an interest and community ownership in climate action, and inspires collaboration amongst community stakeholders to develop adaptation strategies and solutions."
- The Gulf of Maine Research Institute (GMRI) has a Coastal Flooding Citizen Science program. GMRI provides guidance on how to contribute observations that will help identify high-risk flooding areas in a community. Community members volunteer to identify the weather and water level conditions during flooding events and describe how the flood impacts a community.
- The Maine Department of Inland Fish and Wildlife has a Citizen Science Program, with several different ongoing projects aimed towards monitoring priority wildlife species.
- Maine Audubon has a Community Science Program where volunteers can help collect data to support wildlife conservation

[19] Municipal Climate Adaptation Guidance Series: Overview (2017) (Maine.gov, Maine DACF) (PDF)

[20] Regional Resilience Toolkit: 5 Steps to Build Large Scale Resilience to Natural Disasters (2019) (EPA) (PDF)

[21] Municipal Climate Adaptation Guidance Series: Comprehensive Planning (2017) (Maine.gov, Maine DACF) (PDF)

[22] Comprehensive Planning: Guidance for Puget Sound Communities. EcoAdapt, Bainbridge Island, WA.

[23] Sustaining Places: Best Practices for Comprehensive Plans, PAS Report 578, By David Godschalk, FAICP, David Rouse, FAICP (2012) (American Planning Association)

[24] Georgetown, Maine's Comprehensive Plan

[24] Coastal Community Grant Case Studies, Southern Maine Planning & Development Commission Town of York Comprehensive Plan SLR Chapter (2012) (Maine.gov, Maine DACF, Maine Coastal Program) (PDF)

[26] Town of Kittery Comprehensive Plan: Volume 1 (2018) (PDF)

[27] Municipal Climate Adaptation Guidance Series: Overview (2017) (Maine.gov, Maine DACF) (PDF)

[28] Municipal Climate Adaptation Guidance Series: Overview (2017) (Maine.gov, Maine DACF) (PDF)

[29] IEA Global Status Report, (2018) Page 11 (IEA) (PDF)

[30] Maine Won't Wait, (2020), Page 11 (Maine.gov) (PDF)

[31] Comparison of U.S. Commercial Building Energy Benchmarking and Transparency Policies, October 2021 (Institute for Market Transformation, IMT) (PDF)

[32] Comparison of U.S. Building Audit, Tune-Ups, and Retrocommissioning Policies (IMT)

[33] Comparison of U.S. Building Performance Standards (IMT)

[34] Shellfish Sanitation and Management (Maine.gov, Department of Marine Resources)

[35] Parker Gassett, Katie O'Brien-Clayton, Carolina Bastidas, Jennie E. Rheuban, Christopher, W. Hunt, Elizabeth Turner, Matthew Liebman, Emily Silva, Adam, R. Pimenta, Jason. Grear, Jackie Motyka, Daniel McCorkle, Esperanza Stancioff, Damian, C. Brady & Aaron, L Strong (2021) Community Science for Coastal Acidification Monitoring and Research, Coastal Management, 49:5, 510-531, DOI: 10.1080/08920753.2021.1947131 (Taylor & Francis Online)

7: Funding and Financing Opportunities

Two of the core principles of climate adaptation are that inaction increases risk and action reduces risk. Further, many financial analyses indicate the cost of doing nothing far exceeds the associated costs for proper planning and implementation of climate adaptation and mitigation projects. Following a recommendation from the Maine Climate Council, the State of Maine and Eastern Research Group, Inc. produced a report, *Assessing the impacts climate change may have on the State's economy, revenues, and investment decisions*. Volume 1 of the report is a Vulnerability Analysis (Maine.gov) (PDF) (including maps) and Volume 2 is the Cost of Doing Nothing Analysis (Maine.gov) (PDF). Refer to the respective maps and reports for more information on this research and analysis, and how it applies to local communities.

This introduction provides guidance for municipal officials that was developed through local, regional, and federal partners. Section 7.1 provides information and resources on available federal, state, and private grant opportunities. Section 7.2 provides an outline and introduction to these different types of financing mechanisms.

In 2020, the New England Environmental Finance Center (NEEFC), Casco Bay Estuary Partnership (CBEP), and Maine Department of Environmental Protection (DEP), with assistance from Resilience Works, LLC, and support from USEPA Region 1, offered a workshop series focused on crafting successful proposals toward sustainable financing of climate resilience and stormwater related projects. This series offered knowledge sharing, idea exchange, and real-world advice and inspiration. Materials and recorded presentations from several funding programs available through various Maine state agencies including the Maine Department of Transportation (DOT), Maine Department of Agriculture, Conservation, and Forestry (DACF), and Maine DEP are available on the workshop website.[36]

Participant feedback from these workshops was also synthesized into a Community Resilience Funding Guidance Series, which assembles the wisdom and expertise of local municipal officials on the challenges and opportunities to funding community resilience initiatives. Included are reported challenges and needs and identified actions for municipal officials to address community resilience – from developing plans and understanding a longer-term vision to implementing specific projects.[37]

The information in the Community Resilience Guidance Series report, Setting Municipalities up for Success, is focused on how to build a team, how to engage with community members on plans and projects, how to become more self-reliant for financing, and how to access outside funding sources with steps that align with the Resilience Building Framework. Excerpts of key recommendations from this report include:

- **Establish a team and build capacity** – Project teams with knowledge of the funding and fiscal landscape will be better prepared to develop and implement a resilience strategy.
- **Focus on community outreach and build local support** – An engaged community can provide the public incentive leaders need to justify the cost of building climate resilience into the town budget. Educate your fellow leaders, identify those with expertise, and tap into the existing knowledge base. Town leaders and staff need to be educated, too. If everyone begins to look at climate resilience as a component of everything they do, undiscovered expertise and previously unrecognized opportunities for cross-collaboration may be found.
- **Self-reliant financing: Assess your needs with climate resilience in mind** – It is important to prioritize actions according to needs and budgets. Incorporate "no regrets" actions into routine municipal improvements such as road repair with stormwater upgrades, including green infrastructure and culvert replacements. Aim for holistic planning.
- **Find funding sources** – It is important to pick the right one(s) and get the application in on time.
- **Share resources: Take a regional approach** – Look for towns that share your challenges and partner with them.[37]

7.1 Grant and Loan Funds

Grant opportunities are abundant, and programs exist for a plethora of municipal needs ranging from community organizing, outreach, and planning to construction and town purchases. There are also many grant programs for land protection and open space that can allow for marsh migration, wildlife/habitat adaptation, or other resilience needs. Grants for development and resilience are often necessary and can be highly effective in carrying out important community actions. However, the grant process itself can also be a demanding and challenging departure from the itinerary of local governance. Competing in grant programs requires staff capacity to apply, to carry out time-stamped implementation, and for project reporting. Restrictions in how grant money can be used can at times be rigid, thus excluding broader community needs and limiting integration. Also, the intervals

of awards and interruptions in available funding from grants can challenge the ability of municipal staff to retain operational knowledge from past experiences. Collectively, while grant-based funding for municipal efforts is often essential, such approaches can have maladaptive consequences for unified community climate adaptation and can reinforce a discordant patchwork of local climate resilience initiatives.

Nonetheless, well-chosen grant programs can powerfully galvanize community action and accelerate local adaptation to climate change. The following resources and guides provide more information on relevant state, federal and private funding sources.

7.1.1. State Funding

Maine Climate Change Adaptation Providers Network

The Maine Climate Change Adaptation Providers Network (CCAP) Funding and Financing page includes a Funding Guide that includes descriptions of several State funding programs relevant to climate change adaptation and mitigation as well as a number of additional federal, state, and private funding sources. The Guide also includes information on eligibility and example projects for which those grants are commonly used. The Guide is available in Appendix F of the Maine CRW. Visit the webpage frequently for updates to this Guide.

Community Resilience Partnership

The Governor's Office of Policy Innovation and the Future (GOPIF) launched a new funding program for municipalities and service providers in Maine – the Community Resilience Partnership (Maine.gov). Refer to Section 5.4 for an overview of this program and visit the website for more information on the funding mechanisms.

Maine Department of Agriculture, Conservation and Forestry

Coastal Community Grants (Maine.gov, Maine DACF) is a competitive grant program for projects designed to improve water quality, increase adaptation to erosion and flooding, restore coastal habitat, promote sustainable development, and enhance the coastal-dependent economy while preserving coastal natural resources within Maine's coastal zone (Maine.gov, DMR). Since 2012, this grant program has provided over $2 million for projects throughout coastal Maine. Case studies focus on sharing lessons learned "in their own words" and can be found on the Coastal Community Grant Case Studies page (Maine.gov, Maine DACF).

Maine Department of Environmental Protection

The Maine Department of Environmental Protection (DEP) grants and loans page includes information on current state loans and grants, many of which are also detailed in the CCAP Funding Guide.

Maine Department of Marine Resources

The Shore and Harbor Planning Grant program (Maine.gov, DMR) provides resources on a competitive basis for shoreline access planning, waterfront and harbor planning, identification and resolution of waterfront use conflicts, and planning, feasibility, and design efforts for resilient waterfront infrastructure. Shore and Harbor Planning Grant projects are often well prepared to compete for construction funding through other sources.

7.1.2 Private Foundation Funding

In addition to these state and federal funding sources, there are also opportunities to apply for grants from private foundations, many of which utilize the Maine Community Foundation (MCF) as their administrator for the grantmaking process. MCF offers a number of grant-funded opportunities that are detailed on their Competitive Grant Programs & Deadlines page. The Maine Philanthropy Center (MPC) maintains an up-to-date Grantmaker's Directory that includes over 400 foundations that have a history of supporting Maine nonprofits. The Directory is available in online and print versions.

MPC members have free access to the online directory, and non-members can either access the print version by visiting their office at the University of Southern Maine's Glickman Family Library or by purchasing a print copy.

7.1.3. Federal Funding Opportunities and Guidance

There are numerous Federal Funding Opportunities (FFO) that can be searched on the Grants.gov website. In addition, the resources in this section provide details on key FFOs for climate resilience, coastal resilience, and community resilience through nature-based solutions.

New England Environmental Finance Center

The New England Environmental Finance Center (NEEFC) Funding Guide recently published a new funding resource, Navigating the Federal Funding Landscape: A Guide for

Communities (PDF). Across federal agencies, there are numerous grants and loans to help communities fund local environmental and climate-related priorities. Yet at the community level, navigating these programs and identifying the appropriate opportunities for a particular jurisdiction is a big challenge and a barrier to taking action toward funding priority projects.

This guide was developed with small- and mid-sized villages, towns, cities, and Tribes in mind to help these communities align priorities with available funding and serve as a jumping-off point for additional research, before investing time and energy into the application process.

This guide provides a snapshot of more than 20 major federal funds that support local environmental and climate-related priorities. To relate this guide to ongoing technical assistance provided by the NEEFC and its partners in communities around the country, we have focused on federal grants and loans that support activities related to four key themes: climate resilience, water resource management, renewable energy, and sustainable agriculture.

Funding sources for Open Space and Wetland Conservation

- Grants North American Wetlands Conservation Act (NAWCA) Grants: US Standard (U.S. Fish and Wildlife Service)
- National Coastal Wetlands Conservation Grants (U.S. Fish and Wildlife Service)
- Land for Maine's Future (Maine.gov, Maine DACF)
- Maine Outdoor Heritage Fund (Maine.gov, Maine Department of Inland Fisheries & Wildlife)

NOAA Digital Coast – Guide for Funding and Financing Coastal Resilience

The guide, Funding and Financing: Options and Considerations for Coastal Resilience Projects (NOAA) (PDF), includes information on different types of funding for coastal resilience, and details benefits, considerations, and examples for each type of funding.

FEMA Mitigation Grants

Visit the MEMA Mitigation Grants website for more information.[38]

Building Resilient Infrastructure in Communities (BRIC) – supports states, local communities, Tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program guiding principles

are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.[39]

Flood Mitigation Assistance (FMA) – funds states, local communities, Tribes, and territories to reduce or eliminate the risk of repetitive flood damage to buildings and structures insured under the National Flood Insurance Program (NFIP). This grant program strengthens national preparedness and resilience and supports the mitigation mission area through FEMA's strategic goal of building a culture of preparedness.

Hazard Mitigation Grant Program (HMGP) – These are post-disaster grants that become available after a Presidential disaster declaration. This program provides funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages in communities that have already experienced significant damages from a major natural disaster.

Building Community Resilience with Nature-Based Solutions: A Guide for Local Officials – The 'Implementation Phase' section of the guide, Building Community Resilience with Nature-Based Solutions: A Guide for Local Officials (FEMA) (PDF), provides information on various sources of public and private investments, from grants, taxes, fee-based incentive programs, bonds, loans, public-private partnerships, credit trading, and other typologies.

7.2 Finance Options

When grants are not appropriate for a community initiative, or when efforts require ongoing and long-term support, there are a variety of financing mechanisms to meet the fiscal needs of municipal climate change adaptation such as revolving loan funds, taxes and fees, bonds, and public-private partnerships.

Funding and Financing information – New England Environmental Finance Center's Tools and Resources page developed *Demystifying the Language of Climate Resilience Financing* in 2022 clarifies key financial terms and industry jargon with simple definitions and real-life examples to address information gaps and share innovative options to pay for climate resilience needs.

This section will include descriptions of asset classes and innovative and developing financing tools, including:

- **Bonds:** A bond is a financial instrument representing the debt of the company (i.e., corporate bond) or government (i.e., government bond) that issued it. Examples covered include municipal, green, catastrophe (insurance-linked security), resilience bonds, and bond banks.
- **Enterprise Fund:** Enterprise funds are self-supporting government funds that provide public goods and services for a fee, which is then used to continue supporting that good or service.
    - **Internal example:** fee-based enterprise funds (wastewater, stormwater for example); or a financing agency as a component unit of the government.
    - **External example:** publicly chartered financing authority, and Public-Private Partnerships (P3s).
- Enterprise funds, and internal and external financing institutions
- **Value Capture:** Value capture is the process of recovering project costs by capitalizing on the value that the project creates. Examples covered include tax proceeds, special assessment district, tax incremental financing, and joint development.
- **Impact Investing:** Impact investing connects investors' capital and business skills to social or environmental enterprises.
- **Public-Private Partnership (P3):** A public-private partnership is a cooperative arrangement between a public sector entity and a private sector company to finance and implement a project.
- **Performance-Based Financing:** Performance-based financing (also referred to as results-based financing and pay-for-performance) is a contractual agreement between a funder and an implementer that establishes specific outputs or outcomes an implementer must achieve to receive payment by the funder.
- **Insurance:** Insurance is the guarantee of financial reimbursement in the event of a specified event in exchange for payments (i.e., premiums). Examples covered include National Flood Insurance Program (NFIP), parametric insurance, and reinsurance.
- **Green or Resilience Bank:** Green or resilience banks are publicly sponsored, mission-oriented financing authorities. These public or quasi-public institutions combine private and public funds and expertise.
- **Credit Trading System:** Credit trading systems, often referred to as "cap and trade," put a limit or "cap" on the units of pollution allowed within a specified area, such as carbon emissions or nutrient pollution in watersheds.

- **Revolving Loan Fund:** Revolving loan funds are established by an initial investment that is then loaned out; as loans are repaid, the fund is replenished, and that capital can be reloaned for additional projects.

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[36] New England Finance Center (NEEFC) Climate Resilience Funding Workshops website,

[37] Resilience Funding Guidance Series: Setting Municipalities up for Success (2021) (NEEFC) (PDF)

[38] Mitigation Grants (Maine.gov, Maine Emergency Management Association)

[39] Building Resilient Infrastructure Communities (FEMA)

8: Technical Assistance

Municipal officials, especially in small municipalities, have diverse project portfolios and responsibilities. Thus, even when informational resources or tutorials for climate data tools target municipal audiences, these efforts may assume more specialization than is typical for decision-makers in small municipalities. Targeted information such as placed-based forecasts for climate change, precipitation patterns, sea-level rise, and storm surge hazards, may more immediately improve municipal abilities to carry out projects to improve resiliency, but understanding this information may also assume more specialization than is typical for municipal or Tribal decision-makers. Public officials need accurate projections using the latest climate science and for those projections to be packaged as actionable guidance. Yet, the scope of public officials' and department leaders' daily activities also limits their availability to explore and gain expertise within discrete subject matter. Thus, we anticipate a need for climate adaptation practitioners and boundary-spanning entities including the Maine Climate Science Information Exchange Office to provide services at the scale of individual municipalities.

Especially in coastal Maine, and at a time when community climate change adaptation has not matured into routine operations, it is essential to foster partnership and collaboration between municipal leadership and climate change practitioners. Many university programs, NGOs, and consulting and engineering organizations have staff that are interested and available to collaborate with local efforts. County, regional, and State level governing bodies also have staff with experience in climate resilience. It is important to acknowledge the social nature of collaboration and to start making connections with local and regional organizations. The Peer-to-Peer Connections page on the Climate Change Adaptation Provider's (CCAP) Network website describes opportunities for community representatives to attend meetings and conferences that adjoin climate change practitioners state-wide. As communities engage with networks of practitioners, find out what motivates them and their respective institutions and explore ways that their mission and the needs of a community can overlap.

Connecting climate change practitioners with municipalities also improves the positioning of communities to acquire outside resources through various pathways. A discrete example is when practitioners share information about funding, assistance, or training opportunities available for towns. Similarly, climate practitioners can be helpful in crafting town proposals that are competitive in a landscape of grants with often exclusive academic

parlance. More broadly, when practitioners collaborate directly with municipalities, critical insights can be gained regarding the most salient barriers and opportunities for communities to engage in adaptation to climate change. Practitioners and their affiliations and networks are often embedded within broader contexts of developing research agendas and policies for climate resilience. Thus, practitioners' experiences from collaboration at the municipal scale can help shape institutional priorities to better meet community needs. All these steps align with the 'Consider Community and Landscapes' step of the Resilience Building Framework (Figure 1).

8.1 Regional Planning and Economic Development Organizations

There are currently nine regional planning and economic development organizations throughout Maine. Each organization has a geographic scope, with most areas spanning more than one county.[40]

8.1.1 Androscoggin Valley Council of Governments

The Androscoggin Valley Council of Governments (AVCOG) has assisted communities with road washouts and culvert repairs due to flooding and storms and now also provides services related to the Community Resilience Partnership. AVCOG now has a regional resiliency coordinator and an environmental and resiliency planner. In the past, the primary climate adaptation program that AVCOG has worked on with their communities was the grant, Municipal Stream Crossing Upgrade Grant Program (Maine.gov, Maine DEP), for stream culvert upgrades. They receive limited funding from the Maine Municipal Planning Assistance Program to help communities in applying for the DEP funds. Outside of these sources, AVCOG has not historically had funding for climate resilience work as an inland region. There has been less demand for these services among the communities they serve because assistance is provided on a fee-for-service basis.[41]

8.1.2 Hancock County Planning Commission

The Hancock County Planning Commission (HCPC) offers services to towns in their region ranging from Comprehensive Planning, economic development planning, climate resilience, recreational trails, transportation planning, and development review. They provide towns with assistance in identifying and preparing grant applications for multiple municipal and regional needs.

8.1.3 Lincoln County Regional Planning Commission

The Lincoln County Regional Planning Commission (LCRPC) provides service to municipalities throughout Lincoln County. In addition to services in economic and community development, LCRPC has a regional brownfields assessment program, a wide range of municipal planning services, and a resilience staff. They issue "LCRPC Interprets!" a monthly climate newsletter with a focus on a particular topic from Maine Won't Wait and guidance on how municipalities can address the issue and find connections, action opportunities, and community resources.

8.1.4 Northern Maine Development Commission

The Northern Maine Development Commission (NMDC) offers the following services to municipalities in their region that are working on climate adaptation: grant writing, program development, project management, planning services, loans, and business counseling. As described in Section 5.3, NMDC and The Nature Conservancy (TNC) are also collaborating on a community resilience project funded by GOPIF.[42] The GROWashington Aroostook Plan and consortium in particular, which is co-led by NMDC, focuses on climate change and infrastructure resilience.

8.1.5 Eastern Maine Development Corporation

The Eastern Maine Development Corporation (EMDC) is prioritizing climate resilience through the July 2021 release of the Comprehensive Economic Development Strategy (CEDS), a five-year plan for regional economic development. The CEDS presents actionable strategies within five goal areas, one of which is Climate Resilience. A significant part of the CEDS implementation process will be expanding the technical assistance framework EMDC provides to include climate adaptation and resilience services.[43] EMDC formed a regional planning commission in 2022 and provides planning and land use services in Penobscot and Piscataquis counties.

The Climate Resilience Goal is to foster methods of adaptation and mitigation to strengthen the region's resilience against climate-related impacts. The first strategy to meet this goal is to support the goals and strategies of Maine's Climate Action Plan through the following objectives: develop a regional climate needs assessment, identity building and transportation infrastructure of key concern, and provide specialized technical assistance to communities. The second strategy is to support clean energy by assisting with grant development for projects that support renewable energy generation and climate adaptation and encouraging investments in climate-ready infrastructure.

The CEDS provides readers with data that quantifies the impacts of climate change on the regional economy and the greater consequences if immediate action is not taken. The report acknowledges that "Without increased technical assistance and impactful steps towards mitigation, the region risks job loss and decreased productivity in key sectors such as tourism, agriculture, forestry, and transportation." More information is available on the Comprehensive Economic Development Strategy page(Eastern Maine Development Corporation).

8.1.6 Kennebec Valley Council of Governments

The Kennebec Valley Council of Governments (KVCOG) received funding from the 2020 CARES Act Economic Recovery Package for direct relief to stimulate and stabilize the economy. This funding has allowed KVCOG to establish two Community Resilience Coordinators, whose focus through 2022 was to help communities prevent, prepare for, and respond to the pandemic as well as other disaster preparation and prevention. This project aims to engage in and assist the region with:

- Economic Recovery Planning
- Regional Resiliency collaboration and initiatives
- Preparing Technical Assistance Strategies
- Addressing economic dislocations caused by COVID-19
- Preparing and/or updating community resiliency plans
- Implementing entrepreneurial support programs to diversify economies
- Constructing public works and facilities that will support economic recovery, including broadband infrastructure.

The Resilience Series is one approach to engaging the community, and KVCOG has held webinars on culverts and plans to hold a webinar on flooding preparedness and planning, amongst other topics. Information from these and other outreach and community engagement efforts around resiliency will be included in their 5-year Comprehensive Economic Development Strategy (CEDS), implemented in 2022.

8.1.7 Midcoast Council of Governments

The Midcoast Council of Governments (MCOG) is a membership-driven organization serving the entirety of Sagadahoc, Lincoln, and Knox counties, and select communities in Cumberland County (Harpswell and Brunswick) and Waldo County (Northport, Lincolnville, Searsmont, and Belmont). MCOG was formerly the Mid-coast Economic Development District. In addition to traditional planning services, MCOG remains the Economic

Development Administration (EDA) designated economic development district for the region; it identifies funding sources and assists with grant writing as part of membership dues. In Damariscotta, MCOG (then called MCEDD) assisted with grant writing in 2019 to receive funding from the Economic Development Administration (EDA) and Federal Emergency Management Association (FEMA) for their future floodwall and stormwater system.[44]

8.1.8. Greater Portland Council of Governments

The Greater Portland Council of Government (GPCOG) supports both inland and coastal towns in the region in data collection, planning, and project implementation for climate action. Their Municipal Climate Action Planning program describes a series of projects to help support resilience in the GPCOG region. Specific projects and partnerships are described in the Section:

- **Sustainability data and mapping** (Section 4.1)
- **Resilience Pilot program with Bridgton and Windham** (Section 5.3)
- **Climate Ready Casco Bay** (Section 5.3)
- **GOPIF Community Resilience Partnership** as a CRP service provider supporting climate action grants for members.
- **Community Intertidal Data Portal** (Section 5.3)

8.1.9. Southern Maine Planning and Development Commission

The Southern Maine Planning and Development Commission (SMPDC) offers services to their communities and manages multiple regional resiliency projects. These are further described in Section 5.3. More information is available on their Sustainability and Resilience (SMPDC):

8.1.10. Washington County Council of Governments

The Washington County Council of Governments maintains a web presence as it seeks to secure staff and reorganize after the loss of all of its staff in early 2021. Resources on the website from earlier work provide a Climate Vulnerability Assessment for Washington County, storm surge scenarios for coastal embayments, regional climate resilience projects, and links to funding opportunities.

8.2 Maine County Commissioners and County-based Organizations

The voters in each of Maine's 16 counties elect three, five, or seven commissioners to four-year terms to oversee the operation of county government. Each commissioner serves a separate district within the county. Commissioners are the counties' chief elected officials and are ultimately responsible for the fiscal operations and policy decisions affecting county government. Additional duties include municipal tax abatement appeals and hearings on the maintenance of town roads. They also serve, in effect, as the municipal officials in Maine's many unorganized territories. Fifteen Maine counties belong to the Maine County Commissioners Association.

In Maine, emergency management is coordinated regionally by Emergency Management Agencies (EMAs) in each of our 16 Counties. County Commissioners appoint County Directors, and they are funded partly by the county and partly by federal funds provided through MEMA. A directory of the county EMAs is available on the County and Local: County Emergency Management Agencies page (MEMA).

County EMAs provide an invaluable link between the almost 500 cities and towns in Maine, and the State. They provide support and leadership in preparedness, response, recovery, and mitigation to their local, business and volunteer partners.

Soil and Water Conservation Districts (SWCDs) are subdivisions of the State Government, governed by locally elected Boards of Supervisors. There are sixteen SWCDs in Maine which generally correspond to county boundaries, although there are a few exceptions (Table 5). SWCDs establish local priorities for conservation efforts. Emphasis is on agriculture and forestry although urban development is a priority in some districts. SWCDs hold workshops, set up demonstrations, offer educational programs, review development plans, and set priorities for one-on-one technical assistance, at the request of land occupiers.[45]

Table 5 – County and Regional Organizations

County Commissioners	Soil and Water Conservation District	Other County/Regional Planning and Economic Development Corporations
Androscoggin	Androscoggin Valley	—

Aroostook	• St. John Valley • Central Aroostook (Facebook) • Southern Aroostook	—
Cumberland	Cumberland County	Southern Maine Planning and Development Commission (Town of Baldwin only)
Franklin County Sheriff's Office	Franklin County	—
Hancock	Hancock County	Hancock County Planning Commission
Kennebec	Kennebec County	—
Knox	Knox-Lincoln	—
Lincoln		Lincoln County Regional Planning Commission
Oxford	Oxford County	Southern Maine Planning and Development Commission
Penobscot	Penobscot County	Eastern Maine Development Corporation

Piscataquis	Piscataquis County	Eastern Maine Development Corporation
Sagadahoc	—	—
Somerset	Somerset County	—
Waldo	Waldo County	—
Washington	Washington County: Email: Nate Pennell at nate.pennell@myfairpoint.net)	Sunrise County Economic Council and Washington County Council of Governments
York	York County	Southern Maine Planning and Development Commission

8.3 Volunteer or Fellowship Programs

When evaluating the capacity to conduct a particular project, there are opportunities for support beyond municipal staff, volunteers, and consultants. Depending on the type of project and availability of a supervisor or mentor, there are fellowship programs where students or recent graduates can add capacity for a term, summer, or up to one year. This section describes some of the local fellowship programs in Maine.

8.3.1 AmeriCorps Resilience Corps

The Greater Portland Council of Governments (GPCOG) hosted the first cohort of Resilience Corps in 2021. Resilience Corps is a partnership between GPCOG and AmeriCorps, which supports local government agencies, nonprofit agencies, and regional cohorts in the Greater Portland area in their recovery from the COVID-19 pandemic. Fourteen Resilience

Corps members assisted projects related to regional, community, or organizational resilience and helped to accelerate civic innovation, climate action, racial equity, and digital equity for all Mainers. There was a new cohort of fellows in 2022. The mission of this program is to add new capacity in local governments to adapt and proactively respond to both short-term and long-term challenges to economic, social, and environmental systems throughout the region.

8.3.2 Maine Climate Corps

The *Maine Won't Wait* report identified capacity as a limitation to climate adaptation. One recommendation in the report to address this is to "Start the Maine Climate Corps for climate-related workforce development by partnering with service-learning organizations to launch a Maine Climate Corps program by 2023."

To this end, the Maine legislature proposed LD 722, "Resolve, To Study the Establishment of the Maine Climate Corps," which was made a law on June 8, 2021. This legislation tasks Volunteer Maine with:

- studying and identifying projects and tasks in state agencies that could be made into service projects for citizens of the state; and
- recommending how best to structure the Maine Climate Corps, which was proposed in the Maine Climate Council's Climate Action Plan, Maine Won't Wait.

Volunteer Maine Commissioners and staff conducted the study and released a Maine Climate Corps Report to the 130th Maine State Legislature (PDF) which includes information on their methodology, potential projects for Climate Corp fellows, and the impacts of these projects.

Other Local Fellowship and Internship Programs

Please review Table 6 for a list of relevant programs that communities may plan to use when following the Resilience Building Framework (Figure 1).

Table 6: Fellowship, volunteer, and internships programs

Organization	Type of programs	Contact
Bates	Purposeful Work Internships, national fellowships, environmental internships, environmental capstone courses	Bates Center for Purposeful Work, Email: purposefulwork@bates.edu
Bowdoin College	National fellowships, summer fellowships, academic year research	Cindy Stocks, Director of Student Fellowships and Research, Email: cstocks@bowdoin.edu
University of Maine	• The Bodwell Center for Service and Volunteerism • Student Success and Credential Attainment • National Research Traineeship (NRT) in Conservation Science, • Innovate for Maine, Foster Center for Innovation • Mitchell Center for Sustainability Solutions • Maine Climate Science Information Exchange Internship Program	View contact information for each of the programs listed to the left.

University of Southern Maine	Data Innovations Project: Applied Research Fellowship	Becky Wurwarg, Email: datainnovationproject@gmail.com
Volunteer Maine (Maine.gov)	AmeriCorps, Maine Service Fellows (2022), Maine Climate Corps (2022)	Volunteer Maine Service Commission's About the Commission page (Maine.gov)
Island Institute	Island Fellows Program: providing residential internships supporting island communities.	Island Fellows Program
Note: The organizations and programs listed are a sample of those available in the state, and do not represent an exhaustive list.		

8.4 Nonprofits and Academia

There are many nonprofits and academic institutions in the state that have climate programs and projects, from research and monitoring to adaptation and mitigation. Table 7 provides an overview of current program areas and/or services offered by a selection of organizations and institutions. This information represents a snapshot of programs and services that will change, so please visit their websites for more information. This is not an exhaustive list, as there are many other local organizations and academic institutions working on climate-related issues.

Table 7: Organizations that focus on climate adaptation and may provide resilience-related technical support.

Organization	Program Areas/Services	Contact
Casco Bay Estuary Partnership	Research and monitoring; Casco Bay Academy (municipal training); State of the Bay (5-year monitoring reports); Casco Bay Monitoring Network and Plan; habitat protection and restoration; data clearinghouse;	Curtis Bohlen
Downeast Institute	Marine research, shellfish hatchery, ocean acidification lab, and education	Sara Randall and Dr. Brian Beal
First Light Initiative	Bridge between conservation organizations and Penobscot, Passamaquoddy, Maliseet and Micmac Communities to expand Wabanaki stewardship of land.	Peter Forbes
Friends of Casco Bay	Science – water quality monitoring and analysis, Baykeeping, community engagement	Mike Doan and Ivy Frignoca
Gulf of Maine Research Institute	Climate Center; preparing communities for sea level rise; middle-school climate education (LabVenture); resilience training; fisheries modeling; convening	Gayle Bowness

Island Institute	Clean energy; ocean acidification; sea level rise; funding programs; training programs;	Susie Arnold and Sam Belknap
Maine Sea Grant	Healthy coastal ecosystems; resilient communities and economies; preparing for climate change; safe and sustainable seafood; environmental literacy and workforce development	Parker Gassett, Kristen Grant, and Jessica Brunacini
Manomet	Research and monitoring – fisheries, forestry, and agriculture; Climate Smart Land Network (CSLN); education; watershed resiliency; green infrastructure; habitat resiliency (coastal and migratory birds)	Andy Whitman and Marissa McMahan
Mitchell Center for Sustainability Solutions at the University of Maine	Community partnerships, sustainability science, environmental justice, education and professional networking, collaborative grant opportunities	David Hart
New England Environmental Finance Center	Climate resilience funding workshops; Casco Bay Academy; technical assistance (watershed management, ecological restoration, climate resilience); policy development	Martha Sheils

The Nature Conservancy	Sea level rise and inland flooding planning and adaptation; decision support tools; financial and technical resources for community adaptation programs; incorporating social vulnerability consideration in adaptation planning; nature-based solutions; hazard mitigation.	Jeremy Bell
Wells National Estuarine Research Reserve	Lobster and shellfish biology; water quality monitoring; sea level rise planning and adaptation; Southern Maine watershed protection efforts; municipal and teacher training programs;	Annie Cox and Jason Goldstein
*Listed program areas/services represent a sample of climate-related services. Please visit the respective websites for a complete list.		

There are many colleges and universities in Maine that offer education and research on climate change impacts, adaptation, and resilience. Some offer specific degrees, especially at the graduate and technical level, and other liberal arts colleges offer interdisciplinary approaches. There is a range of focus areas from physical/biological, to social, cultural, and economic. Communities may choose to engage with their local academic institutions to work with interns and classes on applied climate adaptation projects.

8.5 Maine-based Consultants

There are many consultants and businesses that provide technical assistance, project management, and program development services. Some are national or international businesses, and others are small, independent businesses. Whether large or small, local expertise and knowledge of your community is key. Table 8 includes a sample of businesses that are either based in Maine or have offices in Maine. These businesses were selected primarily because of their work on local projects. Inclusion in the workbook does not imply endorsement by any of the authors or funders.

Table 8: A list of Maine-based consultants, their service areas and example projects.

Company	Location(s)	Key Service Areas	Local Projects**
FB Environmental	Portland, Maine and Dover, New Hampshire	Climate change monitoring, impact analysis, municipal resilience planning, vulnerability analysis, adaptation strategies, stakeholder engagement, capacity building, resilient infrastructure planning and design	Bar Harbor, Maine Flood Resilience Checklist Wells; Maine Flood Resilience Checklist (w/ SMPDC); model coastal resilience ordinance with Tremont, Wells, Kittery, Vinalhaven and South Portland; Cape Elizabeth, Living Shoreline Project; Blue Hill, Living Shoreline Project; coastal resilience assessment for the Town of Gouldsboro; Comprehensive plan updates for the towns of Wells and Bar Harbor (climate resiliency focus)

GEI Consultants	Portland, Maine, Nationwide	Municipal infrastructure, coastal and waterfront engineering, transportation, environmental planning, climate adaptation, land use planning	Tides, Taxes and New Tactics (Wells Reserve at Laudholm)
Linnean Solutions	Portland, Maine, Boston, Massachusetts	Climate adaptation and resilience planning; GHG inventories; climate action planning (mitigation); municipal sustainability planning; climate hazards vulnerability assessments; resilience and sustainability policy and design standards; community process design, facilitation, and training	One Climate Future (Portland/S. Portland)
Naomi Merman Consulting	Portland, Maine	Clean energy and renewable strategy, community engagement, facilitation, evaluation and planning	Lewiston Tree Streets Net Zero Energy Community Feasibility Findings and Roadmap

Rbouvier Consulting	—	Economic analysis, risk mitigation, social and environmental sustainability, workshop design and facilitation,	Tides, Taxes and New Tactics (Wells Reserve at Laudholm) City of Portland Integrated Stormwater & Wastewater Management Plan Or Carrying Capacity of Or Carrying Capacity of the Blue Hill Peninsula
Resilience Works	Brooksville, Maine, New Jersey	Resilience funding and financing	GOPIF Community Resilience Pilot
Waterview Consulting	Harpswell, Maine	Project management; needs assessment; strategic communication; graphic design; writing and editing; co-production of knowledge; information collection, analysis, and synthesis	Casco Bay Climate Vulnerability Report (CBEP)

*Listed service areas represent a sample of services. Please visit the respective websites for a complete list.

**Listed local projects may not represent all relevant projects in Maine.

8.6 State, Tribal, and Federal Partners

The Maine Interagency Climate Adaptation (MICA) Work Group is coordinated by the Department of Environmental Protection (DEP) and has representatives from eight state agencies sharing the information forum. The group continues a 2013 Governor's request to create an interagency effort to coordinate state adaptation activities (the Environment and Energy Resources Work Group). Members consolidate resources for adaptation, resilience, and mitigation, and collaborate on opportunities for cross-agency projects including making available existing information and assistance opportunities on the state climate webpages and Maine Adaptation Toolkit. More information, including a list of the state agencies and relevant programs, is available on The Maine Interagency Climate Adaptation (MICA) Work Group page (Maine.gov, Maine DEP).

President Biden's Executive Order 14008 (January 28, 2021) required major Federal agencies to develop an adaptation and resilience plan to address their most significant climate risks and vulnerabilities. On October 7, 2021, the White House announced the release of more than 20 Federal Agency Climate Adaptation and Resilience Plans. As part of these efforts, agencies will integrate adaptation and resilience planning and implementation throughout their operations and programs and will continually update their adaptation plans. The agency plans are available on the Climate Resilient Infrastructure and Operations page (Office of the Federal Chief Sustainability Officer).

Wabanaki Tribal Nations actively steward and manage natural resources and many of these activities are led through their respective natural resource departments as listed in Table 9. Representatives of these departments are involved in many collaborative efforts with state and federal agencies, non-profit organizations, and academia.

Table 9: Wabanaki Tribal Nations natural resource programs and contact information.

Tribal Nation	Programs	Contact Info
Mi'kmaq Nation	Air quality, drinking water quality, indoor air quality, natural resource management, emergency planning and	codonnell@micmac-nsn.gov

	preparedness, environmental lab, and environmental education	
Houlton Band of Maliseet Indians	Environmental planning, environmental protection and forestry, water resources, and real estate services	Contact Us page (Houlton Band of Maliseet Indians – Natural Resources)
Penobscot Nation	Department of Natural Resources: Air quality, brownfields, conservation law enforcement, big game biology, fisheries, forestry, GIS mapping, and water resources	Contact Info on the Department of Natural Resources page (Penobscot Nation)
Passamaquoddy Tribe at Indian Township Reservation	Water Resources	Contact Us page (Passamaquoddy Tribe at Indian Township)
Passamaquoddy Tribe – Pleasant Point Reservation	Environmental planning, water quality, brownfields, GIS, environmental science and fisheries, and climate change	Email Marvin Cling, Sr., Email: marvin@wabanaki.com or call 207.853.5134

[40] Directory of Maine Economic Development Organizations (U.S. Economic Development Administration, EDA).

[41] Lauren Jordan, email message to author, October 4, 2021, and Shelly Norton, email message to author, October 5, 2021.

[42] Jay Kamm, email message to author, October 4, 2021.

[43] Anna Stockman, email message to author, October 4, 2021.

[44] Maxwell Johnstone, email message to author, October 1, 2021.

[45] Maine DACF, Soil and Water Conservation Districts website.

9: Professional Development Opportunities

There are several professional development opportunities throughout the state and region. Each training is geared toward a specific skill, process, tool, or resource. The Climate Change Adaptation Provider's (CCAP) Network website compiles opportunities on its peer-to-peer connection webpage. The other opportunities listed in this section offer training courses at different intervals, some quarterly, while others are annual opportunities. Many of these offerings are low or no cost to participants. The regional planning organization listed in Section 8.1 may also be able to provide information on other training opportunities. In addition to training, there are workshops and professional associations that offer development and networking opportunities.

Why is it important to invest in professional development?

- Provide leadership to increase staff capacities and capabilities to obtain the knowledge and skills needed to respond to adaptation needs.
- The absence, or limited capacity, of adaptation experts across society, and particularly in municipalities, can impede participation in existing programs and integrating adaptation concepts into processes and decision-making.
- Investing in staff professional development for knowledge and skill building to address challenges of limited capacity or expertise.
- Creating peer-to-peer training opportunities for knowledge-sharing.

9.1 Ongoing Training

9.1.1 Community Resilience Informed by Science and Experience (C-RISE)

Coastal rural communities have deep cultural connections to and rely heavily upon the marine environment and economy. Due to their remoteness, isolation from central planning agencies, and lack of financial and municipal resources, they are highly vulnerable to climate impacts such as sea level rise. The Gulf of Maine Research Institute (GMRI) and key project partners, Upswell and the Island Institute, will develop, convene, and facilitate community resilience trainings by which Maine's rural coastal communities can increase their capacity to plan and prepare for coastal climate impacts by developing the knowledge, skills, and relationships necessary to create data- and community-informed climate resilience plans. These trainings engage resilience professionals in Maine to share and represent their resources as communities apply those to their newly acquired skills

and frameworks for community planning and decision-making. Community leaders from the regional trainings will continue their learning through participation in a professional learning community. Community resilience trainings will build climate literacy and capacity for developing coastal resilience plans that benefit the social, environmental, and economic health of the community and align with Maine's Climate Action Plan.

The development and implementation of this project is guided by an advisory group that includes representatives from NOAA's Office for Coastal Management, Maine Sea Grant, Wells National Estuarine Research Reserve, the State of Maine's Governor's Office of Policy Innovation and the Future, Maine Geological Survey, Maine Department of Environmental Protection, the Town of Vinalhaven, and the Town of St. George. Researchers at the University of Maine, Orono are serving as project evaluators.

9.1.2 Coastal Training Program (CTP)

The Coastal Training Program (Wells Reserve at Laudholm) provides science-based information, tools, and skills for better managing coastal resources. The CTP is managed by Wells National Estuarine Research Reserve, and offers technical assistance, training, and workshops. Their primary audiences are municipalities (staff, boards, committees), land trusts and property owners, state and federal agencies, public utilities (water, sewer, energy), as well as developers and contractors.

9.1.3 Casco Bay Coastal Academy

Casco Bay Coastal Academy (Casco Bay Estuary Partnership) is a quarterly workshop series aimed at building the knowledge base of municipal board members about critical coastal issues and providing skills training to support their project planning and implementation. Casco Bay Academy is offered through a partnership between Casco Bay Estuary Partnership, the New England Finance Center, and Cumberland County Soil and Water Conservation District.

9.1.4 Climate Resilience Funding Workshop Series

The New England Finance Center organized a series of workshops in 2020 focused on crafting successful proposals toward sustainable financing of climate resilience and stormwater-related projects. This series offered knowledge sharing, idea exchange, and real-world advice and inspiration. Participants were led through successive sessions that built upon one another, from understanding what grant agencies look for in their applications, to beginning the process of establishing sustainable financing sources.

Workshop presentations and a Community Funding Guidance Series are posted on the New England Environmental Finance Center webpage: Climate Resilience Funding Workshop Series. Check the webpage for future training opportunities.

9.1.5 Island Institute's Trainings and Events

The Island Institute hosts a number of events, workshops, and conferences throughout the year for community leaders, small businesses, educators, artists, fishermen, and coastal residents to increase resilient leadership in their communities.

9.1.6 Facilitation Training

Maine Sea Grant offers customized facilitation training for organizations whose mission aligns with theirs. For more information, visit their Sea Grant Facilitation Skills Training page. Good Group Decisions in Brunswick, Maine offers meeting facilitation training, amongst other training seminars. For more information, visit the Craig Freshley's Trainings on How to Get Along page on their site.

9.1.7 Wabanaki Reach Workshops

Wabanaki Reach is a nonprofit organization with the following mission: "We support the self-determination of Wabanaki people through education, truth-telling, restorative justice, and restorative practices in Wabanaki and Maine communities. We design our structures and processes to be responsive to Wabanaki communities and beneficial to Wabanaki people."

They convene Wabanaki Reach Workshops, which provide an opportunity to reflect on histories of colonization and ways to transform injustices that Wabanaki Tribes continue to face and resist. These workshops are designed for non-Native people and include a brief history of the U.S. government's relationship with Native people, awareness of white privilege, and an introduction to decolonization.

9.1.8 U.S. Climate Resilience Toolkit Training Guides

In October 2022, NOAA and partners released Implementing the Steps to Resilience: A Practitioner's Guide (NOAA) (PDF), a handbook for national climate resilience. The book, with accompanying online resources, is designed to help climate adaptation practitioners work with local governments and community organizations to incorporate climate risk into equitable, long-term decision-making. With this user-friendly guide, resilience and

adaptation professionals can learn how to implement the U.S. Climate Resilience Toolkit's Steps to Resilience page.

All five of the guides are available for free in the NOAA Institutional Repository:

- Implementing the Steps to Resilience: A Practitioner's Guide (NOAA) (PDF)
- Ready-to-Fund Resilience (NOAA) (PDF) supports practitioners' work within the climate resilience funding and finance system.
- Centering Equity in Climate Resilience Planning and Action: a Practitioner's Guide (NOAA) (PDF) recommends equity principles to apply during adaptation and resilience planning.
- Moving from Faith-based to Tested Adaptation Process and Approach: How Will We Know We're Adapting? (NOAA) (PDF) emphasizes the evaluation and measurement of adaptation practices.
- Incorporating Nature-based Solutions into Community Climate Adaptation Planning (NOAA) (PDF) uses the "Steps to Resilience" framework to explore nature-based adaptation.

9.2 Conferences and Symposia

There are many conferences in Maine, New England, and throughout the United States on climate adaptation and related topics. This section describes a sample of relevant and ongoing conferences that provide opportunities for learning, networking, and sharing your local projects.

9.2.2 Maine Climate Council Conference

Governor Mills and the Maine Climate Council invited city, town, and Tribal leaders, and interested community members, to a day-long climate conference with useful tools, resources, and how-to case studies for communities across Maine.

The first Climate Council Conference was held June 17, 2022, at the Augusta Civic Center as a Day of Inspiration, Collaboration, & Action (Maine.gov).

9.2.3 Maine Sustainability & Water Conference

The Maine Sustainability & Water Conference provides an annual forum where professionals, researchers, consultants, citizens, students, regulators, and planners gather to exchange information and present new findings on sustainability and water resource issues in Maine.

Launched in 1994 by the University of Maine's Senator George J. Mitchell Center with a primary focus on the future of Maine's water resources, the conference has grown to incorporate topics related to many of the sustainability challenges facing Maine, including issues related to climate change, energy futures, agriculture, forestry, fisheries, tourism, and municipal planning. The conference attracts a broad audience of close to 400 participants from across the state.

The conference is typically held at the end of March. More information is available on the Maine Water Conference page (UMaine's Senator George J. Mitchell Center for Sustainability Solutions).

9.2.4 Beaches Conference

The Beaches Conference (Maine Sea Grant) works to provide continuing opportunities for the exchange of the most current information among beach and coastal stakeholders with diverse interests to facilitate informed decision-making, as well as celebrating beach monitoring and stewardship, building strong partnerships, and taking informed action on coastal issues. The conference is held every other year, typically during the month of June in southern Maine.

9.2.5 Maine Partners in Emergency Preparedness Conference

The Maine Emergency Management Administration sponsors this conference, along with the State Emergency Response Commission and the Maine Association of Local Emergency Managers (MALEM). More information is available on the Maine Partners in Emergency Preparedness Conference page (Maine.gov, Maine Emergency Management Administration).

9.2.6 Local Solutions Conferences

Antioch's Center for Climate Preparedness and Community Resilience (AU|CCPCR) partnered with the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Agency (NOAA) to convene three biennial Local Solutions climate preparedness conferences. The conferences were held in 2016, 2018, and 2021. More information from these conferences is available on the Local Solutions Conferences page (AU|CCPCR).

9.2.7 Maine Fishermen's Forum

Founded in 1976, the mission of the Maine Fishermen's Forum is to provide opportunities on a continuous basis to educate the public and the fishing industry about fisheries and marine resource issues, and to provide a neutral platform for constructive discussion and decision-making. The Forum is held annually, always on the first weekend in March at the Samoset Resort in Rockport. The Forum is a three-day event that includes a trade show, concurrent seminars, receptions that feature local fish, and a fundraising auction. The first day of the Forum is dedicated to Shellfish Focus Day, which is hosted by the Maine Department of Marine Resources (DMR) and the Shellfish Advisory Council. The following two days focus on a variety of state and federal fisheries research, conservation, and management topics, in addition to safety training and cooking demonstrations. More information is available on the Maine Fishermen's Forum website.

9.2.8 National Adaptation Forum

The National Adaptation Forum is a gathering of adaptation professionals to innovate, network, and focus on established and emerging climate adaptation issues.

There are in-person events as well as online content. The virtual Forum provides a space for the adaptation community to share best practices, learn new skills and ideas, and build networks in the time between their in-person meetings. The Forum includes opportunities for professional development through formal training sessions, facilitated practitioner presentations, and informal exchange of information in the form of in-person gatherings and online.

The goals of the National Adaptation Forum are:

- Provide a professional development opportunity for adaptation practitioners
- Contribute to the development of a community of practice around climate adaptation
- Create a space for practitioners to share information, progress, and strategy, building the capacity of the community as a whole and the individual
- Support on-the-ground implementation by providing practitioners with a community to exchange knowledge of and tools for incorporating climate adaptation into their work

9.3 Professional Associations and Networks

There are a number of professional associations and networks focusing on climate adaptation and resilience. Each organization has unique offerings, including professional

certifications, training, resource libraries, and meetings. This section provides an overview of the leading organizations in the region, Country, and internationally.

9.3.2 New England Municipal Sustainability Network

The New England Municipal Sustainability (NEMS) Network is a consortium of New England cities and towns that collaborate to build more sustainable communities consistent with the goals of the Global Covenant of Mayors. Their vision is to create a sustainable New England by building strong connections among municipal sustainability professionals throughout the region, allowing members to accomplish more than would be possible alone.

The NEMS Network consists of municipal sustainability professionals who advance mutually beneficial sustainability goals in the region through collaboration and information sharing. The NEMS Network is a recognized member of the Urban Sustainability Directors Network. The University of New Hampshire Sustainability Institute serves as the backbone organization for the NEMS Network. More information is available on the New England Municipal Sustainability Network website.

9.3.3 Association of Climate Change Officers

The Association of Climate Change Officers (ACCO) is a professional development organization and cross-sector community of practice for individuals addressing climate change in their organization's operations and mission. ACCO membership fosters collaboration with leading-edge practitioners, policymakers, climate scientists, and researchers to advance solutions and build capacity in addressing climate change.

ACCO offers professional development, networking, leadership development, and a credential as a Certified Climate Change professional. More information is available on the Association of Climate Change Officers (ACCO) website.

9.3.4 American Society of Adaptation Professionals

The American Society of Adaptation Professionals (ASAP) supports and connects professionals to better prepare for climate change. ASAP helps members strengthen their professional network, exchange best practices, and practical advice, and accelerate innovation-all leading to a more equitable and effective climate adaptation practice. More information is available on the American Society of Adaptation Professionals (ASAP) website.

Example resources from ASAP:

- Living Guide to the Principles of Climate Change Adaptation – a synthesis of existing and aspirational principles of effective adaptation practice. The content draws on a variety of field-spanning white and gray literature describing adaptation practice, as well as ASAP member and adaptation community reflections on the state of the field.
- Knowledge & Competencies Framework for Climate Change Adaptation and Climate Resilience Professionals – articulates a holistic set of foundational knowledge concepts and core competencies that are necessary for all climate change adaptation and climate resilience professionals. ASAP uses the Framework to guide and assess members' and partners' climate change adaptation and climate resilience education programs.
- ASAP Code of Conduct and Professional Ethics – the values, beliefs, principles, and guidelines climate change adaptation and climate resilience professionals should adhere to ensure ethical and effective practice. Individuals sign onto the Code of Ethics when they become ASAP members.

9.3.5 International Council for Local Environmental Initiatives

Local Governments for Sustainability (or ICLEI) is a global network of more than 2500 local and regional governments committed to sustainable urban development. They are active in more than 125 countries and influence sustainability policy and drive local action for low-emission, nature-based, equitable, resilient, and circular development. Their members and team of experts work together through peer exchange, partnerships, and capacity building to create systemic change for urban sustainability.

ICLEI makes sustainability an integral part of urban development and creates systemic change in urban areas through practical, integrated solutions. They help cities, towns, and regions anticipate and respond to complex challenges, from rapid urbanization and climate change to ecosystem degradation and inequity.

The local and regional governments in the ICLEI network confront these challenges by incorporating sustainability into day-to-day operations and policy. ICLEI invests in the capacity and knowledge needed to design solutions and make decisions informed by data, scientific evidence, and local realities and pressures. More information is available on the Local Governments for Sustainability (ICLEI) website.

9.3.6 International Society of Sustainability Professionals

The International Society of Sustainability Professionals (ISSP) is the world's leading professional association of sustainability professionals. ISSP works to make sustainability standard practice through empowering professionals to advance sustainability in organizations and communities around the globe. As a professional association, ISSP improves the skills of sustainability practitioners through ISSP Sustainability Professional Certification, education, knowledge sharing, research, and professional credentials. More information is available on the International Society of Sustainability Professionals (ISSP) website.

9.3.7 Global Covenant of Mayors for Climate and Energy

The Global Covenant of Mayors envisions a world where committed mayors and local governments – in alliance with partners – accelerate, ambitious, measurable climate and energy initiatives that lead to a low-emission and climate-resilient future. They support ambitious, locally relevant solutions in sectors where cities can have the most significant impact. These cities register, implement, and monitor their strategic action plans and make information on their efforts and results publicly available. More information is available on the Global Covenant of Mayors for Climate and Energy website.

Appendices

Appendix A — History of Maine Climate Actions

Year	Action
1995	Anticipatory Planning for Sea-Level Rise Along the Coast of Maine, EPA
2000	**Maine Climate Action Plan, Maine State Planning Office**
2001	**Climate Action Plan, New England Governors and Eastern Canadian Premiers**
2003	LD 845 "An Act to Provide Leadership in Addressing the Threat of Climate Change", 121st Legislature
2004	**Maine Climate Action Plan (GHG inventory), Maine DEP**
2005	Regional Greenhouse Gas Initiative Memorandum of Understanding, RGGI
2006	First Biennial Report on Progress Toward Greenhouse Gas Reduction Goals, Maine DEP
2007	Gov. Baldacci's Letter to the University of Maine for Creating Maine Climate Future Report

2007	Maine adopts legislation and rules to implement Regional Greenhouse Gas Initiative, RGGI
2008	Second Biennial Report on Progress Toward Greenhouse Gas Reduction Goals, Maine DEP
2009	Maine's Climate Future: An Initial Assessment, University of Maine
2009	LD 460 "Resolve to Evaluate Climate Change Adaptation Options for the State", 124th Legislature ● "DEP shall establish and convene a stakeholder group to evaluate the options and actions available to Maine people and businesses to prepare for and adapt to the most likely impacts of climate change." ● "DEP shall build upon the 2009 climate impact assessment by the University of Maine"
2010	Third Biennial Report on Progress Toward Greenhouse Gas Reduction Goals, *Maine DEP*
2010	**People & Nature Report: Adapting to a Changing Climate Charting Maine's Course, Maine DEP** ● The most likely impacts of climate change in Maine are identified in Maine's Climate Future Report and the vulnerability of the natural and societal systems are further assessed in the findings and recommendations sections of the People and Nature report. The report contains more than 60 recommendations for action to plan for changes to Maine's climate. ● Complete a Climate Change Adaptation Plan for Maine (Phase II)

2012	Fourth Biennial Report on Progress Toward Greenhouse Gas Reduction Goals, Maine DEP
2012	Report to Environment and Natural Resources Committee, Maine DEP ● Adopts 2010 report as a working plan to implement
2013	LD 825 "Resolve to Study Climate Change and Implement the Recommendations of the Department of Environmental Protection Report on Climate Change", 126th Legislature
2014	Fifth Biennial Report on Progress Toward Greenhouse Gas Reduction Goals, Maine DEP
2013	Convene Interagency Work Group – Environmental & Energy Resources Working Group, Maine DACF, DEP, DMR, DOT, IFW, GEO ● At the direction of the Governor, convene WG, DEP chair
2014	Monitoring, Mapping, Modeling, Mitigation and Messaging: Maine Prepares for Climate Change, EERWG
2015	Maine's Climate Future (update), University of Maine
2016	Sixth Biennial Report on Progress Toward Greenhouse Gas Reduction Goals, *ME DEP*

2016	Expand Interagency Work Group – Maine Interagency Climate Adaptation Work Group, Maine DACF, DEP, DMR, DOT, IFW, GEO, DHHS-CDC, DVEM-MEMA
2018	Maine Prepares for Climate Change: 2018 Update, MICA
2018	Expand Interagency Work Group – Maine Interagency Climate Adaptation Work Group, Maine DACF, DEP, DMR, DOT, IFW, GEO, DHHS-CDC, DVEM- MEMA, MHPC
2018	Seventh Biennial Report on Progress Toward Greenhouse Gas Reduction Goals, Maine DEP
2019	Maine Prepares for Climate Change: 2019 Update, MICA
2019	LD 1679 "An Act To Promote Clean Energy Jobs and To Establish the Maine Climate Council" ● Established new greenhouse gas reduction goals ● Established framework of the Maine Climate Council ● Requires development of an updated and unified Climate Action Plan across greenhouse gas mitigation, hazard mitigation and adaptation actions, and to be updated every 4 years ● Requires development of a Clean Energy Economy Transition Plan ● Requires report on latest information on climate change effects
2019	Ocean and Coastal Acidification Planning Report, An Action Plan to Address Ocean Climate Change in Maine

2020	Maine joins International Ocean Acidification Alliance
2020	Scientific Assessment of Climate Change and its Effects in Maine, January 2021
2020	Eighth Biennial Report on Progress Toward Greenhouse Gas Reduction Goals, Maine DEP
2020	**Maine Won't Wait: A Four-Year Plan for Climate Action, December 1, 2020**
2021	1-Year Progress Report, Maine Won't Wait
2022	Ninth Biennial Report on Progress Toward Greenhouse Gas Reduction Goals, Maine DEP
2022	Two-Year Progress Report, Maine Won't Wait

Example Agency Actions:

- In 2009, the Climate Change and Transportation in Maine Adaptation Plan was developed to prepare Maine DOT to respond to challenges presented from the 2004 Climate Action Plan and identify solutions in response to the 2009-2010 Adaptation Plan development process. The Plan also positioned MaineDOT to receive support for its proactive approach and commitment to action. The Plan was updated in 2019.
- Since 2010, Maine CDC has used funding from the US Centers for Disease Control (CDC) Climate and Health Program to better understand the potential impact of climate change on public health, complete climate adaptation plans for both vector-borne diseases and extreme heat and to begin implementing vector-borne disease and heat illness intervention activities. Maine CDC has applied CDC's BRACE framework (Building Resilience Against Climate Effects) to address concerns about

the increase in vector-borne diseases over the last decade and to increase public health preparedness for extreme heat events.

- The 2015 Maine State Wildlife Action Plan revision engaged over 100 conservation partners to identify Maine's 378 Species of Greatest Conservation Need (SGCN), and actions needed to prevent further species declines. Many of these actions focus on a greater understanding of and reducing impacts of climate change to SGCN and their habitats and enhancing habitat connectivity to allow for species range shifts and movement.
- The Maine Climate Hub, housed by Maine DEP was launched in 2015 and serves as a Maine-focused and centralized directory of available climate resources. Hub resources are maintained through interagency coordination. DEP additionally partners with organizations to create regional and local professional training opportunities to build capacities and strengthen partnerships to implement a broader statewide response for resilience.
- The 2018 State Hazard Mitigation Plan was the first update in Maine to describe the potential impacts of climate change on natural hazards, which will likely increase the extent of natural hazard events. MEMA intends to corroborate data with the scientific community in hopes of preparing a more climate change-focused plan in 2023. MEMA addresses the effects of climate change on existing natural hazards in the State Hazard Mitigation Plan, and coordinates and supports the development of County-wide Hazard Mitigation Plans in all sixteen counties, all of which are updated every five years. Hazard Mitigation Plans must include natural hazard risk assessments and strategies for mitigating future impacts.
- In 2019-2020, the State Historic Preservation Commission updated the Statewide Historic Preservation Plan and included a goal for resiliency and the effects of climate change for the first time.
- Within the Department of Agriculture, Conservation and Forestry, the Bureau of Resource Information and Land Use Planning has several complementary programs that work closely together to collect, develop, and translate scientifically sound data, and help provide the funding, technical tools, and support needed for municipalities, land managers, landowners, conservation planners, government agencies, and others in Maine to better understand and integrate climate science and resiliency into their decision making.

Additional information can be found on the Maine Climate Hub here:

- Climate/GHG Mitigation (Maine.gov, Maine DEP)
- Adaptation/Preparedness/Hazard Mitigation (Maine.gov, Maine DEP)

Additional information on climate science, and U.S. and international climate policy is maintained in *A Climate Chronology* by faculty at the University of Maine. More information on the A Climate Chronology website.

Appendix B — Model Ordinance Language for Coastal Maine Municipalities

Municipal Guidance for Coastal Resilience was created through a Maine Coastal Community Grant in partnership with Vinalhaven, South Portland, Tremont, Wells, and Kittery, Maine, and prepared by the Southern Maine Planning and Development Commission and FB Environmental Consultants. The guidance document outlines opportunities for incorporating coastal resilience measures in existing municipal land use ordinances by offering technical language for provisions, as well as considerations regarding those provisions, and examples of that work being done elsewhere in the U.S. The table below presents summaries of provisions and language related to coastal resilience, organized according to the existing municipal ordinance(s) that are most applicable to the proposed provision/language, lists associated coastal hazards, and identifies topics of provisions/language. The table also includes color coding based on which existing municipal ordinance(s) the proposed provision/language best applies. There is additional, important information and context that is not included in the table but is available in the full report.

We added this table to this version of the workbook, to demonstrate the relevance of this information for our key audience; however, the content is evolving with the legislative review on sea level rise and other climate measures. SMPDC completed the project and publication of content on April 22, 2022. The project report can be referenced in the Municipal Guidance for Coastal Resilience Model Ordinance Language for Maine Municipalities (SMPDC) (PDF).

Color Key for Table:

	Floodplain Management (light blue)
	Shoreland Zoning (light lime green)
	Subdivision/Site Plan Review (SPR) (light orange)

	Stormwater Management (light green)
	Zoning (light red)
	Wetlands Ordinance (light yellow)

#	Ordinance	Hazard	Topic Strategy	Summary of Provision/Language
1	**Floodplain Management**	Coastal Flooding	Freeboard	Municipalities can require additional freeboard or require freeboard in areas that are outside of the mapped 100-year floodplain in order to reduce flood risk to properties and people, and to address sea level rise.

2	**Floodplain Management**	Coastal Flooding	Establish new flood zone of sea level rise areas and apply floodplain development requirements	**Adopt, by reference in the floodplain ordinance, a supplemental map depicting inundation from the sea level rise scenario(s) for which the community wishes to regulate development.** Incorporate supplemental map, in addition to FIRM, showing areas subject to select future sea level rise/storm surge in floodplain management ordinance and apply existing and/or new floodplain management development standards and requirements to those areas
3	**Floodplain Management**	Coastal Flooding, Natural Resources	Establish new flood zone of sea level rise areas and apply floodplain development requirements	Establish a 'waterfront area' zone that includes areas subject to flooding from sea level rise and storm surge to serve as a buffer zone, allow for flooding in the event of severe storms or sea level rise, and provide recreational open space for public use and access to the water during 'dry' times

4	**Floodplain Management**	Coastal flooding	Prohibit new development in areas vulnerable to future flooding	Prohibit new residential dwelling units in areas vulnerable to future flooding (sea level rise) and in the regulatory floodplain (requires adopting supplemental map, in addition to FIRM, showing areas subject to select future sea level rise for floodplain management ordinance)
5	**Floodplain Management**	Coastal flooding	Prohibit new expansion of existing development in at-risk areas	Prohibit new structures, expansion of existing structures, and increase in impervious surface in VE zone
6	**Floodplain Management**	Coastal flooding	Variance for building height to accommodate freeboard	Allow variance, with necessary BoA approval, for certain dimensional standards when a new or redeveloped structure is elevated above the BFE (e.g., allow for an increase in the maximum building height to account for increased freeboard)
7	**Floodplain Management**	Coastal flooding	Freeboard	Require applicant to submit proposed building elevation that accounts for local projected coastal flooding (sea level rise/storm surge) based on ME Climate Action Plan

				recommendations or other widely accepted sea level rise projections
8	**Floodplain Management**	Coastal flooding; Natural resources	Prohibit certain development activities in at-risk areas; Require development in coastal flood zones to be elevated on piers, pilings, or columns	Prohibit certain activities in VE-zones, including foundations other than open pilings or columns; new or expansion of roads, driveways, or parking lots, or impermeable paving for existing unpaved roads, driveways, or parking lots; and new or proposed expansions of coastal engineering structures

9	**Floodplain Management**	Coastal flooding; Natural resources	Prohibit expansion and reconstruction of structures in at-risk areas	In VE Zone and sea level rise areas, prohibit the addition, alteration or reconstruction of an existing structure that results in an increase in building footprint; repair of a substantially damaged existing structure which results in an increase in building footprint; any increase in impervious surface on a residential lot. This may include, but is not limited to, swimming pools, tennis/basketball courts and retaining walls. (For functionally dependent projects allowed in the VE Zone and sea level rise areas, impervious surfaces accessory to the use are allowed provided an engineer/surveyor licensed in Maine certifies in writing that the impervious surface will not cause an increase in wave run-up, a deflection or channelization of floodwaters, or an increase in the velocity of flow)

10	**Floodplain Management**	Coastal flooding; Natural resources	Lower threshold for 'Substantial Improvement' & 'Substantial Damage'	Change definition of 'substantial improvement' and 'substantial damage' to account for incremental improvements and/or cumulative improvements/repairs over a certain time period. (*e.g.*, 10-year cumulative, or improvements/repairs shall be considered substantial if, within a five-year period, they cumulatively meet the definition of 'substantial improvement')
11	**Floodplain Management** **Shoreland Zoning**	Coastal flooding; Natural resources	Establish new flood zone of sea level rise areas and conserve for public access, recreation, and flood storage areas	Establish a 'waterfront area' zone that includes areas subject to flooding from sea level rise and storm surge to serve as a buffer zone, allow for flooding in the event of severe storms or sea level rise, and provide recreational open space for public use and access to the water during 'dry' times
12	**Subdivision/SPR** **Stormwater Management**	Coastal flooding; Natural resources	Encourage/require green buildings and low impact development	Encourage or require green building performance elements, including the incorporation of on-site retention, detention, and LID treatment of stormwater runoff and on-site and off-site stormwater drainage sized to

	Zoning			accommodate effects of sea level rise, flooding, and increased frequency and intensity of storm events
13	**Subdivision/SPR**	Coastal flooding; Natural resources	Consider sea level rise during the development review process	Require development applicant to submit information about site-specific coastal flooding (sea level rise and storm surge) impacts and development design response measures; The applicant shall, to the extent practicable and applicable, integrate considerations of adaptation planning into their project to promote climate change resilience to protect the natural resource, infrastructure, and people from coastal hazards and climate change impacts
14	**Subdivision/SPR**	Coastal flooding; Natural resources	Consider sea level rise during development review process	Require development application reviewing body (Planning Board) to consider a project's adaptation to potential climate change impacts
15	**Subdivision/SPR**	Coastal flooding; Natural resources; Shoreline change	Resource Protection area removed from lot calculations	Require areas zoned as resource protection to be removed from the total land area for calculations used to determine density and/or lot coverage

16	**Subdivision/SPR**	Coastal flooding; Natural resources; Shoreline change	Conservation / Open Space Subdivision – Prioritization of conserving natural resources and at-risk areas as the first step in the development design	Require open space to be the first consideration in the development design, with priority given to the conservation of important natural resources; habitat; connectivity of conserved lands; water quality protection; recreation opportunities; public access; and protection of areas vulnerable to existing and future (sea level rise) flooding
17	**Subdivision/SPR** **Stormwater Management**	Coastal flooding; Natural resources	Allow for enhanced storm design standards	Allow reviewing body (Planning Board) to require the applicant to design stormwater management components for more intense/severe storm frequency/interval events (e.g., 100-year, 24-hour event; 500-year flood frequency event period, etc.)
18	**Shoreland Zoning**	Coastal flooding; Natural resources	Include areas subject to sea level rise and storm surge in shoreland zoning	Incorporate areas subject to sea level rise, storm surge, and marsh migration in shoreland zoning districts and definitions so that setbacks, buffers, and development standards will apply to areas that account for existing resources and future conditions

19	**Shoreland Zoning**	Coastal flooding; Natural resources	Zone sea level rise and marsh migration areas as protected	Designate areas subject to future sea level rise, storm surge, and marsh migration as 'Resource Protection' in Shoreland Zoning ordinance language and map; or establish a new shoreland zoning district for future coastal flooding and marsh migration with specific protective buffer, setback, and development requirements
20	**Shoreland Zoning**	Natural resources	Prohibit new sewage disposal systems in Resource Protection district	New sewage disposal systems are prohibited in the resource protection district (or a new district that consists of areas subject to sea level rise inundation)
21	**Shoreland Zoning**	Coastal flooding; Natural resources; Shoreline change	Include sea level rise in setback consideration for expansion of nonconforming structures	Expansion of principal and accessory structures within the shoreland zone must meet the resource setback requirements *(if resource area definitions/descriptions are revised to include sea level rise areas)* / the resource setback requirements and sea level rise area setback requirements (*if definitions/descriptions are not revised)*. A substantial expansion is one that increases either the volume or floor area by 30% or more. Structures located less than the required setback from the

				normal high-water line of the selected sea level rise scenario may not be expanded toward the water.

22	**Shoreland Zoning**	Coastal flooding; Shoreline change	Erosion-based setback	Implement an erosion-based setback requirement to regulate development on lots created on or after a selected date. The rule would state that lots created on or after that date shall utilize the current erosion rate setback factor (historical erosion rate multiplied by X# (50, 100, other) years, or intended lifespan of the development) in the calculation of the development setback. If the application of the current erosion rate setback factor in the calculation of the development setback would preclude the placement of permanent buildings, then the erosion rate in effect at the time that the lot was created may be used in the calculation of the development setback, provided that the development conforms to all other development requirements in the municipality's land use ordinances
23	**Shoreland Zoning**	Coastal flooding; Natural resources	Require sea level rise and marsh migration to be incorporated in design and construction of	Establish a new zone(s) of sea level rise and marsh migration areas (*e.g.*, "transitional zone(s)") s and establish development setbacks from those areas; Require that relative/future sea

	Zoning		structures and other activities	level rise and the landward migration of resource areas in response to relative sea level rise (*e.g.*, marsh migration) be incorporated into the design and construction of structures and proposed uses/activities
24	**Shoreland Zoning** **Wetlands Ordinance**	Coastal flooding; Natural resources	Limit vegetation clearing around resources	No person shall remove native vegetation in buffer areas around wetlands and sand dune systems in order to preserve natural protection for storm surge and coastal erosion, except that which is necessary for uses expressly authorized in the district
25	**Shoreland Zoning** **Wetlands Ordinance**	Coastal flooding; Natural resources; Shoreline change	Preserve vegetation around resource	No person shall remove or destroy natural growth essential to the prevention of erosion and storm damage, except that which is necessary for uses expressly authorized in the district
26	**Shoreland Zoning** **Wetlands Ordinance**	Coastal flooding; Natural resources	Increase resource buffer and setbacks	Increase distance of buffer and/or setback from resources (*e.g.*, wetlands, streams, rivers, *etc.*) beyond state minimums

27	**Shoreland Ordinance** **Wetlands Ordinance**	Coastal flooding; Natural resources	Regulate wetlands below the state threshold	Apply shoreland zoning requirements to wetlands smaller than the state 10-acre minimum; require protection of isolated wetlands, vernal pools, and vernal pool habitat
28	**Zoning** **Subdivision/SPR** **Stormwater Management**	Coastal flooding; Natural resources; Shoreline change	Require on-site infiltration of stormwater	Require runoff from impervious roof surfaces to be infiltrated on site. Runoff from traveled ways and parking areas shall be collected and petroleum products removed using Best Management Practices (BMPs) prior to infiltration on-site. On sites where the proposed improvements exceed fifty (50) percent of the assessed value of the property as determined by the CEO, or where repaving is proposed, the Planning Board may also require treatment for stormwater from existing impervious areas. All treatment facilities shall be permanently maintained in full working order by the owners(s)
29	**Subdivision/SPR** **Zoning**	Coastal flooding; Natural resources; Shoreline change	Protect key habitat	Require development to avoid critical plant and wildlife habitat, as identified in Beginning With Habitat data and/or other habitat data

30	**Subdivision/SPR** **Shoreland Zoning** **Zoning** **Wetland Ordinance** (Fee Schedule)	Coastal flooding; Natural resources; Shoreline change	Impact fee for funding coastal resilience	Require applicant to pay an impact fee based on an established fee amount, cost per square foot/acre of development, or some other criteria, to the municipality for municipal use to fund coastal resilience projects such as elevation of low-lying roads, culvert replacement, stormwater infrastructure improvements, etc.
31	**Floodplain Management** **Shoreland Zoning**	Coastal flooding; Natural resources; Shoreline change	Hazard disclosure for real estate transactions	During real estate transactions, require real estate agents or individual sellers acting without an agent to disclose whether a property is located within a flood hazard area designated by FEMA and/or in an area subject to sea level rise
32	**Shoreland Zoning** **Zoning**	Coastal flooding; Natural resources; Shoreline change	Hazard disclosure for real estate transactions	During real estate transactions, require real estate agents or individual sellers acting without an agent to disclose whether a property is located within a flood hazard area designated by FEMA and/or in an area subject to sea level rise

33	**Subdivision/ SPR** (Road/Street Ordinance)	Coastal flooding; Shoreline change	Include sea level rise considerations into road acceptance standards	Municipal road acceptance criteria demonstrating that surface flooding is not expected to impact roadway under projected sea level rise and storm surge conditions

See segment 34 on next page

34	**Zoning**	Coastal flooding; Natural resources; Shoreline change	Coastal resilience overlay zoning district	Establish coastal resilience overlay zone that includes areas subject to existing and future coastal hazards, such as SLR, surge, marsh migration, and erosion * core components to consider/address • General purpose: (a) identifying areas that may be subject to chronic coastal natural hazards including ocean flooding, beach and dune erosion, dune accretion, bluff recession, landslides, and inlet migration; (b) assessing the potential risks to life and property posed by chronic coastal natural hazards, including erosion and earth movement; and (c) minimizing potential public and private risks and losses to life and property due to these chronic hazards through hazard avoidance and development requirements consistent with Statewide Planning Goals; (d) protect barrier

				beach and dune systems; (e) create incentives for development that can withstand sea level rise and increased flooding and frequency and intensity of storms; (f)promote 'green buildings' as defined in ordinance. Identified green building performance elements include incorporation of on-site retention, detention, and LID treatment of stormwater runoff and on-site and off- site stormwater drainage sized to accommodate effects of SLR, flooding, and increased frequency and intensity of storm events; (g) impose additional regulations on an existing zone based on special characteristics in that zone, such as for natural, historical, or cultural resources protection • Phase out development in vulnerable coastal areas experiencing sea- level rise, recurrent flooding, and land loss by limiting or prohibiting new

				development or redevelopment, particularly in a post-disaster context, above a specified legal threshold (e.g., "substantial damage") or requiring development setbacks or the removal or relocation of structures upon the occurrence of future physical impacts or "triggering" events • Prohibit hard/'gray' shoreline armoring structures and promote the use of living shorelines (with natural or nature-based features) to facilitate the construction of natural shoreline protection measures that can enable coastal ecosystems to maintain their connectivity to the surrounding ocean and coastal environment and also remove structural barriers to inland ecosystem migration as sea levels rise and coasts are eroding • Protect inland habitat and species migration corridors and higher ground establishment areas that

				can support and sustain migrating habitats and species through natural resource conservation zones or overlays • Allow increased density and more resilient design standards in higher ground or inland “receiving” areas • Require construction in the 100-year floodplain to be elevated at least 3 feet above the 100-year base flood elevation, and construction in the 500-year (0.2% chance) floodplain to be elevated or floodproofed to 1.5 feet above the 500-year flood elevation. *Or require structures in areas subject to sea level rise to be elevated to 1 foot above the sea level rise scenario flood elevation in all flood zones*. • Use permeable surfaces on new parking spaces, stormwater infiltration; maintenance of open space; and limits are set on paved parking spaces that cannot absorb rainwater. • Basements are prohibited, and electrical system

				components must be raised a foot above the finished floor. Landscaping must consist exclusively of salt-tolerant and native species.

35	**Zoning**	Coastal flooding; Natural resources; Shoreline change	Transfer of development rights	Applicants extinguishing development rights in the coastal overlay zoning district (*requires establishment of new district, or could apply to certain existing Shoreland Zoning districts)* by acquiring open space conservation easements or restricting density of development in that district(s) are eligible for a density bonus of X% for development in designated growth areas (*or districts identified by municipality as target for growth and increased density)*

Appendix C — Example Questions for Community Workshops

As mentioned in Section 4.9, the following questions may be used by facilitators in community planning:

1. What have you identified as a high priority for your community's coastal hazards? From some preliminary conversations, we have gathered that the focus is currently on sea level rise. Is storm surge, and other coastal flood-related hazards such as erosion, extreme precipitation, (rain, snow, or ice), and wind also on your priority list?

- Prompt/Follow-up: If the interviewee does not mention a hazard that you have identified (e.g. saltwater intrusion), probe about this hazard

2. What have you done thus far to address your concerns regarding coastal hazards?

- Prompt/Follow up: Having reviewed information that has been collected to date – and then explore if the projects are not identified initially.
- Prompt/Follow-up: What technical assistance have you received so far? Who provided this? Why was it helpful?

- Prompt/Follow-up: Have you collaborated with other communities in your region?

3. Participants (focus question on who has been participating in planning processes). Who have you worked with or spoken with so far? What role did they play?

- Prompt/Follow-up: based upon a review of town processes, ask about specific individuals if not mentioned.

4. Stakeholders or community leaders (focus question on who has been participating in planning processes) Who has been at the table with you for discussing these hazards or for any work done? What role did they play?

- Prompt/Follow-up: based upon a review of town processes, ask about specific individuals if not mentioned.
- Prompt/Follow-up: Who has not participated or been at the table and why do you think that is?

5. Future stakeholders (focus question on who has been participating in planning processes) What public engagement strategies are being planned? How might you engage the stakeholders who have not been at the table?

6. What barriers or challenges have you encountered or are perceived? What do you anticipate or want to see happen to overcome these challenges or barriers?

- Prompt/Follow-up: based upon a review of town processes, ask about specific challenges if not mentioned.

7. What do you anticipate for assistance needs? From a university? From state agencies? From regional or nonprofit organizations? What roles would be helpful for them to play?

- Prompt/Follow-up: What data needs do you have?
- Prompt/Follow-up: What specific type of technical assistance do you need?

8. What do you envision for a process going forward for addressing coastal hazards in your community? What do you expect your timeline might be? What are your immediate priorities? What do you see as longer-term priorities and why?

- Prompt/Follow-up: What type of technical assistance would you need to achieve these goals?

- Prompt/Follow-up: We are planning regional meetings over the next year. Would you be willing to participate? Are there others we should invite to participate? What would you most hope to gain from participating?

Appendix D — Template for a Community Action Plan

Example template from Maine's Climate Action Plan, *Maine Won't Wait*, adopted December 1, 2020.

Maine Won't Wait (Maine.gov PDF), (HTML5 Flipbook, onlinefliphtml5.com) (Maine.gov Executive Summary PDF) contains eight strategies with dozens of recommendations for implementation. Within the entirety of the Plan, there are a total of 67 recommendations across the eight overarching strategies. The strategies within the Climate Action Plan can also serve a dual purpose for communities in Maine by providing areas where specific actions can be taken. These strategies are listed below and are referenced in the relevant sections below.

- Strategy A: Embrace the Future of Transportation
- Strategy B: Modernize Maine's Buildings: Energy-Efficient, Smart, and Cost-Effective Homes and Businesses
- Strategy C: Reduce Carbon Emissions in Maine's Energy and Industrial Sectors through Clean-Energy Innovation
- Strategy D: Grow Maine's Clean Energy Economy and Protect Our Natural Resource Industries
- Strategy E: Protect Maine's Environment and Working Lands and Waters, Promote Natural Climate Solutions and Increase Carbon Sequestration
- Strategy F: Build Healthy and Resilient Communities
- Strategy G: Invest in Climate-Ready Infrastructure
- Strategy H: Engage with Maine People and Communities about Climate Impacts and Program Opportunities

Maine's Climate Action plan is a blueprint for bold, specific, and immediate action requiring transformational changes in the way Maine produces and consumes energy and incorporates climate change impacts and principles into day-to-day decision-making. Implementing the plan will require a climate-focused recovery to the global pandemic, and a collective effort across state agencies and with individuals, businesses, organizations, and leaders in Maine. Many of the topics and actions included in this Workbook align with strategies and recommendations identified in *Maine Won't Wait*. Best practices presented in

this workbook represent areas where communities might inventory their own actions to identify gaps and pursue further action using the resources and experts provided.

We request a Community Climate Action Plan Template for future editions of this workbook.

Appendix E — Sample Risk Assessment Framework and Guiding Questions

Identifying where communities or assets are most vulnerable, and the extent of the risks are the most important steps in developing strategies to make a community or specific infrastructure more resilient. Answering these Vulnerability and Risk Assessment questions can help planners, asset managers, and other decision-makers understand how natural hazards could impact their community or infrastructure, and the potential consequences of vulnerabilities as a result so that resilient courses of action can be determined. A team can use these questions when beginning a project, for evaluation during a project, and/or after the project is completed to determine if objectives were met. The questions are intended to prompt thinking. They are a sample, starting list to draw from; however, there is some redundancy and collectively they may not represent all critical questions your project aims to address. A team or whole community can use these questions to guide their processes and discussions – outside expertise is often sought out to adequately address them.

Section 4 Assessment, Planning, Implementation, and Evaluation of the Community Resilience Workbook A presents the vulnerability assessment process in more detail. A common framework is available from the five-step process of the US Climate Resilience Toolkit (U.S. Climate Resilience Toolkit). The "Steps to Resilience" are:

1. Explore Hazards
2. Assess Vulnerability and Risk
3. Investigate Options
4. Prioritize and Plan
5. Take Action

Conducting an assessment often begins with determining vision and objectives, followed by understanding natural hazards risks, and vulnerabilities they present, and then determining options to achieve desired outcomes. This can be done through various meetings, and workshops, and often involves consulting with or inviting outside experts to speak to technical information, topics of interest, or where knowledge or information gaps arise in the process. A common practice for engagement is the use of participatory mapping where those involved can visually identify and discuss vulnerable locations and

services on a map of their community or project area and think holistically about planning and actions.

Sample Risk Assessment Questions

Natural Hazards

- What natural hazards are potential risks to your community or infrastructure?
- What is already known from historical information about these natural hazards and the impacts they have caused on your community or infrastructure?
- What is projected for these natural hazards with climate change in the future that corresponds to your community vision or infrastructure timespans?
- What scenarios create the worst-case events for use in your analysis?
- What data sources or community insights were used in your analysis?
- Did you consult with national, regional, and local experts for the best available information?

Hazard Mitigation

- What geographic areas and populations are likely to be affected in the future due to climate change, and how do these impacts differ from the present?
- What are the specific impacts of climate change on the geographical area and populations of interest, and how long into the future are those impacts expected to occur?
- What infrastructure is the most important to ensuring the safety of the town and its residents (e.g., hospitals, evacuation routes, etc.)?
- What built and natural infrastructure can be constructed, improved, or preserved to reduce the impacts of climate change?
- What built and natural infrastructure should be prioritized in terms of making a community more resilient to climate change?

Community Engagement, Outreach, and Adaptive Capacity

- What does your community most care about?
- What does the community envision for its future?
- Who in this community is on the frontlines of climate change and what are they already doing to build resilience?

- What knowledge do community members have about climate change impacts here? What do community members need to know to make informed decisions about adaptation?
- How can educational materials share scientific information and multiple forms of knowledge about climate change? How can this information be designed to accommodate multiple languages, abilities, and perspectives?
- How can this project create opportunities for learning, relationship building, and networking?
- How can intentional approaches to learning, relationship building, and networking help this community change governance structures, like comprehensive plans, ordinances, and budget priorities? What do community members need to know and who needs to be involved to make governance decisions and changes?
- What do community members identify as priority improvements in local governance? What would it take to enact these changes to governance?

Whole Community Resilience

- Who in this community is most vulnerable and what are the specific risks to these groups?
- Who is or who will be most affected by changes in our community? How are those groups responding to these changes?
- Will some people be more affected by changes than others, and what helps explain the differences in who will be affected? Consider differences in race and ethnicity, gender and sexuality, income and socioeconomic status, ability, and age.
- How can affected communities participate in projects to ensure their voices and concerns are represented?
- Who else in this community is already working with affected groups and how can service providers and affected parties become involved?
- How can projects use a bottom-up and inclusive approach to designing and implementing a project?

Socioeconomic and Cultural Consideration

- What are the cultural, social, economic, recreational, and environmental co-benefits that could occur by adapting to climate change in specific ways?
- What and where are the cultural sites that need to be protected from the impacts of climate change? Who needs to be involved in decisions about cultural and historic preservation?

- How is climate change affecting community well-being? How can climate adaptation projects improve community well-being?

Implementing a Plan, Continuous Assessment, and Budgets

- What outcomes matter in this community and how will progress towards these outcomes and eventual success be measured? How can these data be used to inform the project as it evolves?
- Does the plan provide clear, well-defined, flexible, and timely strategies for implementation?
- Does the plan have a timeline for when actions need to be completed to ensure project goals are achieved?
- Are specific stakeholders assigned the responsibility for implementing and monitoring each action?
- Do all actions have well-defined cost estimates and corresponding funding sources?

Appendix F — Funding Guide Maine Government Sources for Resiliency

April 5, 2023

Plan ahead and schedule your work with the timing of these grant and loan programs. Combine complementary grants to address your needs.

Land and Water Conservation Fund (Maine.gov, Maine DACF)

Grants and Community Recreation Bureau of Parks and Lands
124 State House Station, Augusta, Maine 04333
207.624.6090

Douglas Beck, *Outdoor Recreation Supervisor*, Doug.Beck@maine.gov

- **Department:** Agriculture, Conservation and Forestry
- **Grant or Loan?** Grant
- **Who's Eligible?** Community and non-profit non-community public water systems
- **When Available:** Ongoing. Deadline – annually in November
- **What's Fundable – and Why?**
    - **Purpose:** Protection of a drinking-water system's source of drinking water

- **Eligible activities:** Projects that demonstrate a commitment to the ongoing protection of a system's drinking water source, e.g.,
  - Developing or updating watershed management plans
  - Establishing local protective ordinances or legal agreements in the source protection area
  - Developing or implementing drinking water education and public outreach programs Developing and/or implementing lake monitoring programs.

Maine Coastal Community Grants: News (Maine.gov, Maine DACF)

Municipal Planning Assistance Program
22 SHS/Harlow Building, Augusta, Maine 04333-0022

Joan Walton, joan.walton@maine.gov, 207.419.8661
Tom Miragliuolo, tom.miragliuolo@maine.gov, 207.287.3860

- **Department:** Agriculture, Conservation and Forestry
- **Grant or Loan?** Grant
- **Who's Eligible?** Coastal municipalities, coastal unorganized township, groups of coastal municipalities, townships and coastal Regional Planning Organizations
- **When Available:** Ongoing. Typically, applications open in Spring. Subject to available funding.
- **What's Fundable – and Why?**
  - **Purpose:** Improve **water quality**, conserve **coastal habitat**, promote **sustainable development**, enhance the coastal-dependent economy while preserving natural coastal resources, and increase **resilience/adaptation** to **erosion and flooding**.
  - **Fundable Activities:** Vulnerability assessments, adaptation planning, community education, and strategy development).
  - **Please note:** Each project involves **regional or local-level partnerships**, and each grantee provides a minimum of **25% in matching funds** or services. An updated comprehensive plan is required.

Catalyst Program (Northern Border Regional Commission, NBRC)

Charlotte Mace, *Program Manager, Northern Border Regional Commission*
Maine Department of Economic and Community Development,
207.624.7448, charlotte.mace@maine.gov

- **Department:**
    - Economic and Community Development
    - Northern Border Regional Commission
- **Grant or Loan?** Grant
- **Who's Eligible?** State; county; municipal; Tribal nations; public and non-profit organizations. Eligible counties: Androscoggin, Aroostook, Franklin, Hancock, Kennebec, Knox, Oxford, Penobscot, Piscataquis, Somerset, Waldo, and Washington.
- **When Available:** Ongoing.
- **What's Fundable – and Why?**
    - **Purpose:**
        - Revitalize and modernize essential infrastructure
        - Increase access, affordability, and use of high-speed telecommunications
        - Stabilize and reduce electric and thermal energy costs
        - Retain, expand, and diversify business enterprise that capitalizes on the region's natural, cultural, and economic assets
        - Position the Northern Border region counties as an attractive and supportive place for creative and entrepreneurial people
        - Support and expand a highly productive workforce with skills suited to existing and future business needs
        - Foster entrepreneurial leadership and capacity for community economic development
        - Inform and align local, state, and regional economic development decision-making with regional data and perspectives.
    - **Eligible activities:** Comprehensive economic and infrastructure development plans done in collaboration with local development districts, local governments, higher-education centers, and the general public.

Brownfields Assessment and Revolving Loan Fund (BRLF) (Maine.gov, Office of Business Development)

- **Department:**
    - Environmental Protection

    - Economic and Community Development
- **Grant or Loan?** Grants and Loans
- **Who's Eligible?**
    - For grants: Municipalities and qualifying non-profits
    - For loans: Any qualifying entity (public or private)
- **When Available:** Ongoing as funds are available.
- **What's Fundable – and Why?**
    - **Purpose:** Encourage redevelopment of properties that are complicated by the presence or potential presence of hazardous substances, pollutants, or contaminants.
    - **Eligible activities:** Investigations and remediation where necessary to allow for productive reuse of brownfield sites.

Clean Water State Revolving Fund (CWSRF) (Maine.gov, Department of Environmental Protection)

Brandy Piers, *Engineering Services Manager*
Division of Water Quality Management
17 State House Station Augusta, ME 04333-0017
207.287.6093, brandy.m.piers@maine.gov

Maine Municipal Bond Bank
P.O. Box 2268, 127 Community Drive, Augusta, ME 04330
800.821.1113 (toll-free) or 207.622.9386

- **Department:**
    - Environmental Protection
    - Maine Municipal Bond Bank
- **Grant or Loan?** Loan
- **Who's Eligible?** All publicly owned wastewater treatment facilities
- **When Available:**
    - Applications are accepted continuously during the year.
    - The Municipal Bond Bank issues bonds once in the spring and once in the fall.
    - The bond bank's website specifies deadlines for the funding cycles.
- **What's Fundable – and Why?**

- **Purpose:** provide municipalities, school systems, water and sewer districts, and other governmental entities access to low-cost funds through the sale of the bond bank's tax-exempt bonds.
- **Eligible activities:** Examples of eligible projects include but are not limited to:
  - secondary and advanced treatment facilities
  - infiltration and inflow correction
  - interceptors
  - pumping stations
  - force mains
  - combined sewer overflow abatement
  - certain sewer extensions in designated areas and areas of failing septic systems.

Maine Natural Resources Conservation Program:

[Maine In Lieu Fee Compensation Program (ILF) and Maine Natural Resource Conservation Program (MNRCP) (Maine.gov, Maine DEP)]

Dawn Hallowell, *Maine DEP,* dawn.hallowell@maine.gov

- **Department:**
  - Environmental Protection
  - U.S. Army Corps of Engineers
  - The Nature Conservancy
- **Grant or Loan?** Grant
- **Who's Eligible?** Public agencies, non-profit conservation organizations, municipalities, and Tribal nations
- **When Available:** Ongoing
- **What's Fundable – and Why?**
  - **Purpose:** Restore and protect high-priority **aquatic** resources.
  - **Eligible:** Projects that encompass:
    - removal of fill or structures from wetlands and streams
    - salt-marsh restoration
    - preservation of high-quality wetlands and associated upland buffers
    - aquatic habitat restoration and enhancement, e.g., through the removal of small dams or undersized culverts

Maine Natural Resource Conservation Program funding rounds are announced in June. A joint federal and state committee makes funding decisions in the fall.

Municipal Stream Crossing Upgrade Grant Program (Maine.gov, Maine DEP)

John Maclaine, *Maine DEP*, john.maclaine@maine.gov, 207.615.3279

- **Department:** Environmental Protection
- **Grant or Loan?** Grant
- **Who's Eligible?** Local governments, municipal conservation commissions, soil and water conservation districts and private non-profit organizations
- **When Available:** Annual
- **What's Fundable – and Why?**
    - **Purpose:** Improve public safety, minimize impacts to water quality and improve habitat for fish and wildlife.
    - **Eligible activities:** Projects that achieve improvements, modifications, repairs or upgrades to existing stream crossing culverts.

Projects must be located on a municipal road to be eligible. Private Landowners and state and federal agencies are not eligible recipients.

Small Community Grant Program (SCGP) (Maine.gov, Maine DEP)

Brandy Piers, *Engineering Services Manager*, brandy.m.piers@maine.gov, 207.287.6093
Division of Water Quality Management
17 State House Station, Augusta, ME 04333-0017

- **Department:** Environmental Protection
- **Grant or Loan?** Grant
- **Who's Eligible?** Municipalities
- **When Available:** Annual, winter application
- **What's Fundable – and Why?**
    - **Purpose:** Enable municipalities to help replace malfunctioning septic systems that are polluting a waterbody or causing a public nuisance.

- **Eligible activities:** Replace systems that are: (1) contaminating a public drinking water supply, (2) polluting a shellfishing area, (3) discharging into a body of water, or (4) creating a public nuisance condition.

Waste Diversion: Solid Waste Diversion Grant Program (Maine.gov, Maine DEP)

Mark King, mark.a.king@maine.gov, 207.592.0455

- **Department:** Environmental Protection
- **Grant or Loan?** Grant
- **Who's Eligible?** Municipalities, regional associations, counties and Maine businesses
- **When Available:** Spring and Fall announcements
- **What's Fundable – and Why?**
  - **Purpose:**
    - Increase organics management and recycling infrastructure in underserved areas of the state.
    - Reduce waste through reuse, repair, and sharing-economy initiatives.
    - Expand the types of materials managed through composting and recycling.
  - **Eligible activities:**
    Examples:

    - Establishment of regional composting facilities
    - Expansion of municipal reuse programs
    - Recycling polyvinyl chloride fencing and siding.

Wastewater Climate Adaptation Clean Water State Revolving Loan Fund (Maine.gov, Maine DEP)

Brandy Piers, *Engineering Services Manager*, brandy.m.piers@maine.gov, 207.287.6093
Division of Water Quality Management
17 State House Station, Augusta, ME 04333-0017

- **Department:** Environmental Protection
- **Grant or Loan?** Principal-forgiveness loans
- **Who's Eligible?** Municipalities, Wastewater Districts, Quasi-Municipalities

- **When Available:** Temporary incentive offered annually pending federal allotment for "green" projects.
- **What's Fundable – and Why?**
    - **Purpose: Assess adequacy of wastewater systems**
    - **Eligible activities:** Develop climate action plans and fiscal sustainability plans.

Through Maine's State's Clean Water State Revolving Fund, Maine DEP has made available up to **$20,000** per project in loan-principal forgiveness for wastewater utilities to assess their systems and develop climate adaptation plans for them.

Additionally, through loan principal forgiveness, up to **$50,000** per project is available for wastewater utilities to create **fiscal sustainability plans**.

Invasive Aquatic Plant Removal (Maine.gov, Maine DEP)

Karen Hahnel, Karen.A.Hahnel@maine.gov, 207.215.9270

- **Department:**
    - Environmental Protection
    - Lakes Environmental Association
- **Grant or Loan?** Grant
- **Who's Eligible?** Municipal and county governments, quasi- municipal organizations (including water districts) and 501(c)(3)-eligible organizations
- **When Available:** As announced
- **What's Fundable – and Why?**
    - **Purpose:**
        - Plan and manage the removal of known invasive aquatic plant infestations.
        - Reduce the likelihood of invasive aquatic plants spreading to other waters.
        - Limit the impact on natural habitats and on human use of water bodies.
        - Maintain property values in lake-water areas.
    - **Eligible activities:** Support lake organizations that are removing infestations of invasive aquatic plants.

Local Source Water Protection Grant Program (Maine.gov, Maine Department of Health and Human Services) (PDF)

Ashley Hodge, Ashley.hodge@maine.gov, 207.822.2341

- **Department:** Health and Human Services, Center for Disease Control and Prevention
- **Grant or Loan?** Grant
- **Who's Eligible?** Municipalities, water districts, water utilities, community and non-profit, non-community public water systems
- **When Available:** Ongoing
- **What's Fundable – and Why?**
    - **Purpose:** sustain and protect publicly available drinking water
    - **Eligible activities: public water system** projects that, among other objectives, seek to bolster resilience to **drought and flooding** through **infrastructure upgrades**.

Drinking Water Capacity Development Grants

Capacity Development (Maine.gov, Division of Environmental and Community Health)

Sarah Flanagan, sara.m.flanagan@maine.gov

- **Department:** Health and Human Services, Center for Disease Control and Prevention
- **Grant or Loan?** Grant
- **Who's Eligible?** Community, non-profit, and noncommunity public water systems
- **When Available:** Ongoing
- **What's Fundable – and Why?**
    - **Purpose:** sustain and protect publicly available drinking water
    - **Eligible activities:** public water system projects that, among other objectives, seek to bolster resilience to **drought and flooding** through **infrastructure upgrades**.

Drinking Water State Revolving Fund Loans (DWSRF) (Maine.gov, Division of Environmental and Community Health)

- **Nate Saunders**, nathan.saunders@maine.gov, 207.287.5685
- **William Dawson**, William.Dawson@maine.gov, 207.287.6196
- **Department:** Health and Human Services, Center for Disease Control and Prevention
- **Grant or Loan?** Loan
- **Who's Eligible?** Public water systems
- **When Available:** —
- **What's Fundable – and Why?**
    - **Purpose:** bolster resilience to **drought and flooding** through infrastructure upgrades funded by **low-interest loans for capital improvement**
    - **Eligible activities: Public water** system capital improvements

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Land Acquisition Loans Fact Sheet (Maine.gov, Maine DHHS) (PDF)

Ashley Hodge, Ashley.hodge@maine.gov, 207.822.2341

- **Department:** Health and Human Services, Center for Disease Control and Prevention
- **Grant or Loan?** Loan
- **Who's Eligible?** Community water systems, both privately and publicly owned, and non-profit non-community water systems
- **When Available:** Ongoing. No deadline for Land Acquisition Loan applications. Whenever there are land and/or conservation easements available for purchase, a water system may apply for a loan.
- **What's Fundable – and Why?**
    - **Purpose:** protect drinking water supplies through ownership, easements, or other legal control of the land around a drinking water source.
    - **Eligible activities:** purchase of land and/or conservation easement that protect sources of drinking water.

Land Acquisition Loans are administered by the Maine CDC's Drinking Water Program and serviced through the Municipal Bond Bank.

There is **no project limit**, and funding amount is based on available funds at the time of loan application.

Maine Outdoor Heritage Fund (Maine.gov, Maine Department of Inland Fisheries and Wildlife)

Bethany Atkins, Bethany.Atkins@maine.gov, 207.287.5878

- **Department:** Inland Fisheries and Wildlife
- **Grant or Loan?** Grant
- **Who's Eligible?** Qualified sponsoring agencies
- **When Available:** Semiannual
- **What's Fundable – and Why?**
    - **Purpose:** Conserve **wildlife and open spaces**.
    - **Eligible activities:** Projects that promote:
        - conservation of Maine's fish and wildlife habitat
        - acquisition and management of special places
        - protect endangered species
        - conservation law enforcement

Federal Emergency Management Agency Community Disaster Loan Program

- **Department:** Maine Emergency Management Agency
- **Grant or Loan?** Loan
- **Who's Eligible?** Municipalities
- **When Available:** Ongoing. Upon declaration of a major disaster, one may apply for assistance through the Governor's authorized representative.
- **What's Fundable – and Why?**
    - **Purpose:** Offset the loss of local tax revenues or other revenues as a result of a **major disaster**
    - **Fundable activities:** Maintenance of local governmental functions such as **police** and **fire** protection, or **water** and **sewer** services.
    - **Please note:** Loans are not to exceed 25% of the local government's annual operating budget for the fiscal year in which the major disaster occurs, up to a **maximum of $5 million**.

Project Canopy Planning and Planting Grant Applications (Maine.gov)

Questions? Call the Maine Forest Service at 207.287.2791 or the Project Canopy office at 207.287.4987.

- **Department:** Department of Agriculture Conservation and Forestry
- **Grant or Loan?** Grant
- **Who's Eligible?** Municipalities
- **When Available:** Annual. Applications are due in March and require participants in a grant workshop typically in February.
- **What's Fundable – and Why?**
    - **Purpose:** Project supports sustainable community forestry management, increases awareness of the benefits of trees and forests, and increases the health and livability of communities through sound tree planting and maintenance.

Flood Mitigation Assistance Grants (Federal Emergency Management Agency)

Maine Emergency Management Agency
72 State House Station, 45 Commerce Drive, Augusta, ME 04333
800.452.8735 (toll-free)

- **Department:** Maine Emergency Management Agency
- **Grant or Loan?** Grant
- **Who's Eligible?** Local communities that sponsor applications on behalf of property owners.
- **When Available:** Annual.
- **What's Fundable – and Why?**
    - **Purpose:** Reduce or eliminate claims under the National Flood Insurance Program.
    - **Eligible activities:** Projects and planning that reduce or eliminate the long-term risk of flood damage to structures insured under the National Flood Insurance Program.

This program is funded by the Federal Emergency Management Agency.

Local communities sponsor applications on behalf of property owners and then submit the applications to the state. All grant applications must be submitted to FEMA by a state, U.S. territory, or federally recognized tribal nation.

Hazard Mitigation Grant Program (Maine Emergency Management Agency)

Maine Emergency Management Agency
72 State House Station, 45 Commerce Drive, Augusta, ME 04333
800.452.8735 (toll-free)

- **Department:** Maine Emergency Management Agency
- **Grant or Loan?** Grant
- **Who's Eligible?** Local government, state agency, Tribe or Tribal agency, or private nonprofit.
- **When Available:** Available following federal declaration of a disaster in Maine or relevant counties.
- **What's Fundable – and Why?**
    - **Purpose:**
        - Reduce future, long-term risk from natural hazards
        - Increase resilience to natural hazard events that may have been exacerbated by climate change.
    - **Eligible activities:** Risk-reduction projects that have been identified in local hazard mitigation plans prior to the occurrence of a federally declared disaster.

Individuals and businesses may apply through their local government if their local government agrees to serve as the sub-applicant to the state's application for funding.

Volunteer Fire Assistance Program (Maine.gov, Maine DACF)

For more information, contact the VFA Program Administrator.

- **Department:** Maine Forest Service
- **Grant or Loan?** Grant
- **Who's Eligible?** Municipality
- **When Available:** Annual
- **What's Fundable – and Why?**
    - **Purpose:** provide Federal financial, technical, and other assistance to State Foresters and other appropriate officials to organize, train and equip fire

departments in rural areas and rural communities to prevent and suppress wildfires. A rural community is defined as having 10,000 or less population.

Pre-Disaster Mitigation Grant Program (Maine.gov, MEMA)

Maine Emergency Management Agency
72 State House Station, 45 Commerce Drive, Augusta, ME 04333
800.452.8735 (toll-free)

- **Department:** Maine Emergency Management Agency
- **Grant or Loan?** Grant
- **Who's Eligible?** States, territories, federally recognized Tribes and local governments are eligible to serve as sub-applicants for pre-disaster mitigation grants.
- **When Available:** Annual
- **What's Fundable – and Why?**
    - **Purpose:**
        - Reduce overall risk to the population and structures from future hazard events
        - Reduce reliance on federal funding in future disasters.
    - **Eligible activities:**
      Planning and project grants that:

        - break the cycle of disaster damage, reconstruction, and repeated damage
        - raise public awareness about reducing future losses before disaster strikes.

Applicants must be participating in a county hazard mitigation plan approved by the Federal Emergency Management Agency.

Guidance for Severe Repetitive Loss Properties (FEMA) (PDF)

Maine Emergency Management Agency
72 State House Station, 45 Commerce Drive, Augusta, ME 04333
800.452.8735 (toll-free, in-state only) | 207.624.4400

- **Department:** Maine Emergency Management Agency
- **Grant or Loan?** Grant
- **Who's Eligible?** National Floodplain Insurance Program participants.
- **When Available:** Ongoing
- **What's Fundable – and Why?**
    - **Purpose: Reduce flood damages** to insured properties that have had one or more claims to the National Flood Insurance Program.
    - **Eligible activities:**
        - Acquisition or relocation of at-risk structures and conversion of the property to open space;
        - Elevation of existing structures; or
        - Dry floodproofing of historic properties.

Drinking Water SRF Program

Drinking Water State Revolving Loan Fund (DWSRF)

(Maine Municipal Bond Bank)

Maine Municipal Bond Bank
P.O. Box 2268, 127 Community Drive, Augusta, ME 04330
800.821.1113 (toll-free) | 207.622.9386

- **Department:** Maine Municipal Bond Bank
- **Grant or Loan?** Loan
- **Who's Eligible?** All public and private water systems.
- **When Available:** Applications are accepted continuously during the year.
- **What's Fundable – and Why?**
    - **Purpose:** provide municipalities, school systems, water and sewer districts, and other governmental entities access to low-cost funds through the sale of the bond bank's tax-exempt bonds.
    - **Eligible activities:** Examples of eligible projects include but are not limited to:
        - public health projects
        - treatment facilities
        - aging infrastructure
        - main replacement

        - federal Safe Drinking Water Act compliance
        - land acquisition.

Although applications are accepted throughout the year, the Municipal Bond Bank issues bonds once in the spring and once in the fall. The bond bank's website specifies deadlines for the funding cycles.

Grants and RFPs: Coastal Access & Working Waterfronts (Maine.gov, Department of Marine Resources)

Allison Potter, allison.potter@maine.gov

- **Department:** Marine Resources
- **Grant or Loan?** Grant
- **Who's Eligible?**
    - Towns and unorganized townships in Maine's coastal zone
    - Groups of towns /townships in Maine's coastal zone
    - Coastal Regional Planning Commissions; and coastal Councils of Government.
- **When Available:** Ongoing. Subject to available funding.
- **What's Fundable – and Why?**
    - **Purpose:**
        - Promote sound waterfront planning and harbor management,
        - Promote balanced development of shore and harbor areas.
        - Advance planning for waterfront infrastructure improvements and access to the shore.
    - **Eligible activities:**
      Development of:
        - plans for waterfront, harbor and mooring areas
        - regulatory and non-regulatory approaches to waterfront conservation and improvement
        - planning studies for public and working access
        - plans and designs for harbor improvements
        - management plans for municipal waterfront facilities

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Boating Infrastructure Grant (BIG) Program (Maine.gov, Maine Department of Transportation)

Matthew Burns, matthew.burns@maine.gov, 207.624.3409

- **Department:** Transportation
- **Grant or Loan?** Grant
- **Who's Eligible?** Public and private entities
- **When Available:** Maine DOT sends out an announcement each year, typically in the summer
- **What's Fundable – and Why?**
    - **Purpose:** Funding from U.S. Fish and Wildlife Service enables Maine DOT to benefit all users in a harbor or coastal tidewater facility.
    - **Eligible activities:** Waterfront infrastructure projects that benefit recreational transient boats 26 feet or longer.

Small Harbor Improvement Program (Maine.gov, Maine DOT)

Matthew Burns, matthew.burns@maine.gov, 207.624.3409

- **Department:** Transportation
- **Grant or Loan?** Grant
- **Who's Eligible?** Municipalities – coastal and tidewater
- **When Available:** Ongoing application process
- **What's Fundable – and Why?**
    - **Purpose:**
        - promote economic development, public access, improved **commercial fishing opportunities**
        - preserve, and create infrastructure at facilities in tidewater and coastal municipalities
    - **Eligible activities:** protection and enhancement of harbor infrastructure, including commercial and municipal pier and wharf improvements, hoists, ramps, and pilings.

The SHIP program can provide up to $250,000 in assistance towards eligible projects. **The SHIP program requires a 50% local share.**

Research assistance for funding table provided by Allen Kratz, Parker Gassett and Nathan Robbins, Climate Change Adaptation Providers Network

Appendix G — Request for Input to Subsequent Editions

Maine Community Resilience Workbook

Thank you for engaging with the 2023 edition of the Community Resilience Workbook (CRW)!

The Maine CRW, which includes the Climate Adaptation and Resilience Outcomes Tool (CAROT), is a compendium of climate initiatives in Maine and a guide to resources that assist communities and practitioners prepare for climate change. CRW aims to provide a framework and how-to guide for climate change assessment in Maine, taking collective actions, and achieving community resilience outcomes. We request feedback to improve future editions of the workbook and to strategize an online version of the content.

These resources were developed over the last two years and are built upon important work happening across Maine. Throughout 2023, we will incorporate your and others' feedback, release the updated versions of this product, and establish an online portal to deliver guidance and reach experts for technical assistance and peer-to-peer learning. Between now and then, your thoughtful and precise feedback can improve the CRW. Those who provide an in-depth review, work above and beyond to gather feedback from local communities or contribute writing for sections in the CRW will be acknowledged in future publications.

If you share and use this resource with the communities/groups that you work with, you are effectively joining the team. We envision the co-production of this resource to be fully collaborative and intend to reflect that by expanding the team to anyone who steps into a role of a content generator or gatherer. Please use a disclaimer that this is a draft with room for improvement in both style and content. We'd appreciate it if you introduce this work with a caveat akin to, "This is an effort to co-produce practical guidance for addressing climate change at the local level. Editions will improve iteratively with input from diverse stakeholders. Guidance is not prescriptive, rather it is intended to expedite information sharing and connections to build capacity for community resilience initiatives through a process that supports efforts across Maine communities."

There are multiple ways to submit feedback:

1. Complete the online survey or fill out the feedback form (it has the same question as the online survey) and email your responses,
2. Provide edits and comments using track changes directly to the Maine CRW and email your responses,
3. Schedule a meeting with the steering committee.

We've offered initial questions to streamline feedback, though all feedback is welcome.

Please email responses to Parker Gassett at parker.gassett@maine.edu and Nathan Robbins at nathan.p.robbins@maine.gov.

Feedback Survey (Qualtrics) at https://umaine.qualtrics.com/jfe/form/SV_cUa7ainlAouFMP4